

EXHIBIT 1

REDACTED

----- Forwarded message -----

From: **Alaina Kwasizur** [REDACTED]

Date: Mon, Sep 28, 2020 at 12:52 PM

Subject: Sonos Notice

To: Bradley Riel [REDACTED], Tim Kowalski [REDACTED]

Cc: <[REDACTED]>

Dear Tim and Brad,

As you know, Sonos spent years trying patiently and in good faith to resolve Google's infringement of Sonos's intellectual property. Despite Sonos's efforts, our discussions have never meaningfully progressed. Even since we filed in the ITC, Google has increased the scope of its infringement and brought a multiplicity of retaliatory lawsuits in countries around the world. These lawsuits will not have their intended effect.

Attached please find a courtesy copy of the complaint that we will file Tuesday, September 29th in the United States District Court. In this lawsuit, Sonos will focus on Google's infringement of U.S. Patents 9,967,615;

10,779,033; 9,344,206; 10,469,966; and 9,219,460 although, as we have discussed, Google infringes many more of Sonos's patents.

We continue to be hopeful that Google will reconsider its infringement and its refusal to engage in a meaningful discussion.

Best,

--

Alaina Kwasizur

Sonos, Inc. | General Counsel, AMPAC | [REDACTED]

--

Alaina Kwasizur

Sonos, Inc. | General Counsel, AMPAC & Chief Diversity & Inclusion Officer | [REDACTED]

**IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION**

SONOS, INC.,

Plaintiff,

v.

GOOGLE LLC,

Defendant.

§ Case No.

§

§

§

§

§

§

§

§

§

§

§

§

**COMPLAINT FOR PATENT
INFRINGEMENT**

Jury Trial Demanded

COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff Sonos, Inc. (“Sonos” or “Plaintiff”) hereby asserts claims for infringement of United States Patent Nos. 9,967,615; 10,779,033; 9,344,206; 10,469,966; and 9,219,460 (the “patents-in-suit”; attached hereto as Exhibits 1-5 respectively) against Defendant Google LLC (“Google” or “Defendant”), and alleges as follows:

INTRODUCTION

1. Sonos is an American success story. It was founded in 2002 in Santa Barbara, California by a handful of engineers and entrepreneurs with a vision to invent the world’s first wireless, whole-home audio system. At the time, popular audio systems were dependent on a centralized receiver hard-wired to each individual passive speaker throughout a home. Further, most homes with Internet access had dial-up connections, the iPhone was still five years away, and there were no streaming music services. The technological barriers confronting Sonos were enormous.

2. To deliver on its vision, the Sonos team completely reimagined the in-home music system as a decentralized network of smart playback devices, and it developed a platform that

could seamlessly and wirelessly distribute audio room by room or throughout the home at the user's discretion. Sonos created a "choose what to play, where to play it, and how loud" wireless audio system that could not only perform without lag (*e.g.* buffering, or network interruptions), but that was also so simple and intuitive that customers would make it part of their daily lives.

3. Commercial success did not come easy for Sonos as its vision was in many ways ahead of its time. But year by year, consumers – and the entire industry – came to appreciate that wireless multi-room audio devices and systems could not only work, but could become an essential part of the listening experience. Success required staying true to Sonos's disruptive vision, continuing to innovate while adjacent industries caught up and customers became more and more enamored with the idea of Sonos as they had the chance to encounter and use its products. Once Sonos had taken all the risks and placed enormous bets on research and development, the "first followers" began to copy Sonos's innovations.

4. To this day, Sonos remains focused on innovations that further enhance the listening experience. Sonos invests heavily in research and development and, as a result, frequently invents new systems with new technologies, enhanced functionality, improved sound quality, and an enriched user experience.

5. As a result, Sonos has become one of the world's leading providers of innovative audio products. In recognition of its wide-ranging innovations, the U.S. Patent & Trademark Office has granted or allowed Sonos more than 940 U.S. patents, including the patents-in-suit, with hundreds more patents in other countries. The innovations captured by these patents cover many important aspects of wireless multi-room audio devices/systems, including, for example, how to manage and control groups of playback devices, how to facilitate seamless control and transfer of audio playback among devices, and how to output amazing sound quality.

6. The industry has recognized the importance of Sonos's patents. For example, Sonos earned a spot on the IPO list of "Top 300 Organizations Granted U.S. Patents" and the

IEEE recognized Sonos as having one of “[t]he technology world’s most valuable patent portfolios.” *See* Exs. 6 and 7.

7. Sonos launched its first commercial products in 2005 and has since released a wide variety of critically acclaimed, patented, wireless multi-room audio products, including, for example, the Play:1, Play:3, Play:5 (Gen 1 and Gen 2), One (Gen 1 and Gen 2), One SL, Move, Playbar, Playbase, Beam, Sub, Connect, Port, Connect:Amp, Amp, Five, and Arc. *See, e.g.,* Ex. 8. Sonos’s products can be set up and controlled by the Sonos app. *Id.*

8. Sonos’s efforts have made it incredibly popular with its customers. Sonos estimates that in fiscal year 2019, Sonos’s customers listened to 7.7 billion hours of audio content using its products. And, as of September, 2019, almost two thirds of Sonos households had purchased and installed more than one Sonos product.

9. Sonos’s record of innovation has made it the undisputed leader in what has come to be called the “multiroom audio” field. *See, e.g.,* Ex. 9 (2018 Digital Trends: “Sonos is the king of multiroom audio....”); Ex. 10 (2019 What Hi-Fi: “[N]o multi-room offering is as complete or as pleasurable to live with as Sonos.”).

10. Sonos has already sued Google for infringing patents on its first group of inventions involving the set-up, control, playback, and synchronization of wireless playback devices. This case involves a second group of inventions which, as described more extensively below, tackle the novel technological challenges of how to stream music from a cloud-based service, how to create, manage, and invoke “zone scenes” to configure how multiple playback devices work together, and how to dynamically adjust the equalization of a playback device based on the environment in which the playback device is operating.

GOOGLE BEGINS INFRINGING

11. Almost a decade after Sonos created the smart-speaker market, Google entered the space. Initially, Google sought to work with Sonos and, through those efforts, gained access to

Sonos's engineers, products, and technology. All too quickly, however, Google shifted focus and began to develop and sell products that copied Sonos's technology and infringed Sonos's patents.

12. Part of what makes Sonos so successful is that, through its application, Sonos is compatible with many different third-party music streaming services. When Google publicly launched its own streaming music service – Google Play Music – in late 2011, Sonos worked with Google to integrate the Google Play Music service into the Sonos ecosystem. As a result, Google Play Music launched on the Sonos platform in 2014. *See, e.g.*, Ex. 11.

13. This should have benefited everyone: Sonos's customers gained access to another streaming service and Google Play Music users gained access to Sonos's devices. But as the press recognized at the time, Sonos's integration work with Google was especially “deep” and therefore gave Google a wide aperture through which to view Sonos's proprietary technology. *Id.* (2014 Wired: “This is the first time this sort of deep integration has happened between a third party music service and Sonos.”). The copying soon followed.

14. Just eighteen months later, in 2015, Google began willfully infringing Sonos's patents. On information and belief, Google used the knowledge it had gleaned from Sonos to build and launch its first wireless multi-room audio product – Chromecast Audio.

15. Google's Chromecast Audio began what has turned into Google's relentless effort to copy Sonos and use Sonos's patented technology. For example, although Google's original Chromecast Audio did not yet include Sonos's patented multi-room audio functionality, even when it was launched Google was working to add that Sonos-patented feature. *See* Ex. 12 (2015 The Guardian: “Google is also working on multi-room audio streaming using the Chromecast Audio, but it will not support the popular feature out of the box.”). And, when Google added the infringing feature, the press immediately noted how this “major feature update” made Google's product even more “like the ones made by Sonos:”

Google's recently-launched Chromecast Audio adapter is getting a major feature update this week: Consumers will now be able to group multiple Chromecast audio adapters to stream their favorite music simultaneously in more than one room,

similar to the multi-room support available for internet-connected loudspeakers like the ones made by Sonos.

Ex. 13 (2015 *Variety* article entitled “Google’s Chromecast Audio Adapter Gets Multi-Room Support Similar to Sonos”); *see also* Ex. 14 (2015 *Pocket-Lint*) (“You control your Sonos experience with one app. Well, thanks to a new software rollout, Chromecast Audio can pretty much do the same thing.”).

16. This has become a consistent pattern. Time and again, Google has added features to its products that first appeared in Sonos’s products and which make use of Sonos’s patented technology.

GOOGLE’S INFRINGEMENT ACCELERATES

17. Since 2015, Google’s misappropriation of Sonos’s patented technology has proliferated. Google has expanded its wireless multi-room audio system to more than a dozen infringing products, including the Google Home Mini, Google Home, Google Home Max, and Pixel phones, tablets, and laptops. And Google has persisted in infringing even though Sonos has warned Google of its infringement on at least four separate occasions dating back to 2016.

18. For example, in 2016 (a year after Google launched the Chromecast Audio wireless adapter), Google released the Google Home multi-room audio player (which was controlled by Google’s rebranded multi-room controller app – the Google Home app). Unlike the Chromecast Audio, the Google Home added an internal speaker driver making it an “all-in-one” audio player akin to Sonos’s prior Play:1, Play:3, and Play:5 products.

19. Sonos raised the issue of infringement as to these products with Google as early as August 2016. Sonos hoped that Google would respect Sonos’s intellectual property and the extensive work Sonos had put into inventing and developing its products. But Google did no such thing.

20. In October 2016, Sonos put Google on notice of infringement of 28 Sonos patents, including asserted United States Patent No. 9,344,206. Google, however, did not stop infringing.

Instead, it doubled down and introduced new infringing products, making use of *even more* patented technology from Sonos.

21. For example, in 2017, eight years after Sonos introduced its first all-in-one audio player – the Play:5 – Google released its first all-in-one audio players – the Google Home Max and the Google Home Mini. Google’s Home Max in particular was seen as a “Sonos Clone” and a “not-so-subtle copy of the [Sonos] Play:5 speaker....” Ex. 15. As explained by Gizmodo, “[i]t’s also hard not to see the [Google Home Max] device as something of a jab at Sonos.” *Id.*; *see also*, e.g., Ex. 16 (2017 Android Central: “You can’t help but look at Google Home Max... and come to the conclusion that Google is sticking its nose where Sonos has been for years.”).

22. Therefore, in January 2018, and then again in July 2018, Sonos put Google on notice that it was infringing even more Sonos patents, including asserted United States Patent No. 9,219,460. Then again, in February 2019, Sonos put Google on notice of infringement of 100 Sonos patents, including asserted United States Patent No. 9,967,615.

23. Nothing Sonos did, however, deterred Google from expanding its infringement. Google’s infringing product line now includes at least the Chromecast, Chromecast Ultra, Chromecast Audio, Chromecast with Google TV, Home Mini, Nest Mini, Home, Home Max, Home Hub, Nest Hub, Nest Hub Max, Nest Audio, and Nest Wifi Point (individually or collectively, “Google Audio Player(s)”), all of which can be controlled by, for example, the YouTube Music app, the Google Play Music app, the YouTube app, and the Google Home app (individually or collectively, “Google App(s)”). *See, e.g.*, Exs. 17-27.

24. In addition to providing the Google Apps for controlling the Google Audio Players, Google also offers various infringing hardware controllers that are pre-installed with the Google Play Music app, YouTube app, and/or YouTube Music app (and capable of downloading and executing the Google Apps that are not pre-installed). These infringing hardware controllers include, for example, Google’s “Pixel” phones, tablets, and laptops (e.g., the Pixel 3, Pixel 3 XL, Pixel 3a, Pixel 3a XL, Pixel 4, Pixel 4 XL, and Pixel 4a phones, the Pixel Slate tablet, and the

Pixelbook and Pixelbook Go laptops) (individually or collectively, “Google Pixel Device(s)”).
See, e.g., Exs. 28-32.

25. Herein, “Google Wireless Audio System” refers to one or more Google Audio Players, one or more Google Pixel Devices, and/or one or more Google Apps.

26. In order to hold Google accountable for its willful infringement of Sonos’s patents, Sonos filed a complaint in January 2020 asking the United States International Trade Commission (“ITC”) to institute an investigation into Google’s unlawful importation into and sale in the United States of infringing products. The ITC instituted an investigation, *In re Certain Audio Players and Controllers, Components Thereof, and Products Containing Same*, Inv. No. 337-TA-1191 to determine whether Google’s audio players and controllers infringe five Sonos patents directed to fundamental features such as playing music on multiple speakers in synchrony, playing music in stereo over two or more players, a controller that can easily setup a player on a wireless network, and playback-control features such as controlling both the volume of individual speakers and a group of speakers.

27. While the ITC Investigation has been pending, Google has continued to increase its infringement. For example, press reports indicate that Google is introducing new products and changes that mean Google is “one step closer to replacing your Sonos system.” Ex. 33; *see also* Ex. 44 (“The new functionality appears to be the most direct challenge to the likes of Sonos, which has enjoyed enormous success by creating a series of connected speakers and soundbars that can play music simultaneously – or individually.”). The press has similarly noted that Google’s new speaker “could be a new rival for the likes of the Sonos One, the best smart speaker you can buy in 2020.” Ex. 34; *see also* Ex. 44 (“Just like Sonos, you can also change the volume on each speaker individually from the main interface.”). And press reports indicate that Google has expanded its use of Sonos’s stereo pair technology into the new smart-speakers even though Google is *currently* being sued for infringing a Sonos patent on this technology. Exs. 35, 44.

28. Google itself has also highlighted the importance of its use of Sonos’s technology. For example, Google’s Chris Chan publicly stated that “[c]ontrolling the audio throughout my

home, no matter who's listening, has been incredibly helpful" and that "[t]oday, we're expanding that control. You can already manually group Nest devices in order to play the same music on various speakers at the same time, and now we're launching multi-room control so you can dynamically group multiple cast-enabled Nest devices (speakers, Smart Displays, Chromecasts) in real-time to fill multiple rooms with music." Ex. 35; *see also* Ex. 44. Again, Google has expanded its use of this technology *while* it is being sued for infringing Sonos's patents on this precise technology.

29. Google's aggressive and deliberate expansion of its use of Sonos's patented technology has led observers to conclude that "[n]o market is safe from [the] search engine monster" and that Google was specifically "offering new products to compete with Sonos in the music streaming market." *See* Ex. 36.

GOOGLE'S CONTINUED INFRINGEMENT FORCES THIS SUIT

30. In the face of Google's unrelenting infringement, Sonos has no choice but to bring this suit. In this action, Sonos asserts patents that are not at issue in the ITC or the related district court action. Sonos is also accusing Google's Wireless Audio System of infringing different patented features than are at issue in either of those actions.

31. Sonos's ITC suit addressed Google's infringement of Sonos patents covering fundamental aspects of wireless, whole-home audio systems. While groundbreaking, those patents represent only some of Sonos's ongoing innovation from its inception to today. Through its foresight, substantial investment, and relentless pursuit of excellence, Sonos built on its previous success and invented a number of key features consumer have grown to expect and demand in streaming music listening.

32. For example, as explained more fully below, Sonos's U.S. Patent Nos. 9,967,615 and 10,779,033 (the "'615 Patent" and the "'033 Patent," respectively) cover key aspects of Sonos's inventive approach for streaming music from a cloud-based service to a media playback system, including technology for transferring playback responsibility for a cloud-based stream of

media content from a user's device, such as a smart phone, to a media playback system that is then configured to retrieve and play back the cloud-based media content.

33. Sonos was well ahead of the field when it began to develop these inventions in 2011. At that time, Sonos's audio system, including its smart-phone app controller, was in a category all its own. Moreover, streaming content from cloud-based media services for playback by computers – let alone other types of networked devices like smart phones and smart speakers – was in its infancy. Nonetheless, at a time years before Google released its first Chromecast product, Sonos envisioned a novel experience of continuous and intuitive control of a user's entire streaming listening experience, across multiple networked devices, including smart phones and/or smart speakers. That vision gave rise to the innovation of technology for enabling seamless transition of playback responsibility for cloud-based media content between different networked devices, such as a smart phone and a smart speaker. This paradigm is now fundamental across the entire streaming industry as user expectations of continuous listening experiences have continued to converge with Sonos's vision.

34. Similarly, Sonos's U.S. Patent Nos. 9,344,206 and 10,469,966 (the "'206 Patent" and the "'966 Patent," respectively) cover some of Sonos's inventions related to creating, managing, and invoking "zone scenes" to configure how multiple players work together. With these patents, Sonos once again anticipated what consumers would want and invented a new feature for its system. Using the inventions of the '206 and '966 Patents, playback devices can be grouped together for synchronous playback in an easy and intuitive manner using "zone scenes." Advantageously, such a "zone scene" can be accessed and invoked by multiple devices and in various ways (*e.g.*, by voice) even when the particular controller that created the "zone scene" is not on the network.

35. In addition, Sonos's U.S. Patent No. 9,219,460 (the "'460 Patent") covers a Sonos invention related to dynamically adjusting the equalization of a playback device based on its environment. Naturally, consumers want their speakers to sound great, regardless of the environment in which the playback device is operating, but changes in the playback device's

listening environment could impact sound quality. For example, a playback device may be configured to perform advantageously in a small room, but nonetheless may come to be positioned outdoors. When operating outdoors, boosting the bass levels of the playback may result in an improved listening experience for some consumers. However, previous technology for setting the equalization parameters for a playback device made it very difficult to optimize the playback device's equalization parameters for its listening environment. The '460 Patent provides technology that enables a playback device to adjust its own equalization settings based on one or more reflection characteristics of an audio signal in order to optimally match the playback device's listening environment.

36. Sonos provided a pre-filing copy of this Complaint to Google, thereby providing clear pre-suit notice of infringement of the patents-in-suit. Google, however, has never given any indication that it is willing to stop infringing, and did not do so in response to receiving a draft of this complaint.

37. On information and belief, Google is unwilling to stop infringing because its infringement of Sonos's patented inventions has paved the way for Google to generate billions of dollars in revenue. A December 2018 market report by Royal Bank of Canada ("RBC"), for example, concluded that Google sold over 40 million Google Home devices in the U.S. and that Google generated \$3.4 billion in Google Home revenue in 2018 alone. Ex. 37 at pp. 1, 4, 14-15. RBC also found that, as of August 2017, Google had sold more than 55 million Chromecast devices and that Google generated almost \$1 billion in Chromecast revenue in 2018. *Id.* at pp. 4, 16, 18. Further, RBC estimated that, in 2018, Google generated \$3.4 billion in Pixel device revenue. *Id.* at pp. 4, 8.

38. By 2021, RBC estimates that Google will be annually selling over 100 million Google Home devices in the U.S. and generating over \$8 billion in Google Home revenue. *Id.* at pp. 4, 14-15. In addition, by 2021, RBC estimates that Google will annually generate \$2.4 billion in Chromecast revenue and nearly \$7 billion in Pixel device revenue. *Id.* at pp. 4, 8, 18.

39. The revenue obtained from the sale of Google’s hardware devices vastly understates the value to Google of infringing Sonos’s patents. On information and belief, Google is intentionally selling the infringing products at a discount and/or as a “loss leader” with the expectation that this will allow Google to generate even more revenue in the future – e.g., by powering Google’s continued dominance of the market for search advertising. In particular, Google’s infringement of Sonos’s patented inventions has helped and/or will help Google generate significant revenue from the use of Google’s hardware devices including advertising, data collection, and search via the Google Wireless Audio Systems. As the *New York Post* explained, “Amazon and Google both discounted their home speakers so deeply over the holidays that they likely lost a few dollars per unit ... hoping to lock in customers and profit from later sales of goods and data about buying habits.” Ex. 38. Similarly, *News Without Borders* explained that companies like Google are using their “smart speaker” devices as “‘loss leader[s]’ to support advertising or e-commerce.” Ex. 39.

40. On information and belief, Google’s copying of Sonos’s patented inventions has also helped and/or will help Google generate significant revenue from driving its users to make purchases such as streaming music subscriptions and retail purchases via the Google Wireless Audio Systems. For example, an NPR “smart speaker” survey found that 28% of survey respondents agreed that “[g]etting [a] Smart Speaker led [them] to pay for a music service subscription,” and Google offers two such subscriptions – Google Play Music and YouTube Music. Ex. 40 at p. 20. Likewise, the NPR survey also found that 26% of respondents use their smart speakers “regularly” to “add [items] to shopping list.” *Id.* at p. 14; *see also, e.g.*, Ex. 39 (stating that companies like Google are using their “smart speaker” devices as “‘loss leader[s]’ to support... e-commerce.”).

41. On information and belief, Google is willfully infringing Sonos’s patents as part of Google’s calculated strategy to vacuum up invaluable consumer data from users and, thus, further entrench the Google platform among its users and fuel its dominant advertising and search platforms.

42. Google’s infringement – and its strategy to sell its infringing products at a loss to develop alternative revenue streams – has caused significant damage to Sonos. For example, the Google Home Mini predatorily implemented Sonos’s valuable patented technology into an all-in-one wireless multi-room product that Google sells at a highly subsidized price point or even gives away for free. Ex. 41 (“At \$49, Google Home Mini works on its own or you can have a few around the house, giving you the power of Google anywhere in your home.”); Ex. 39 (“Google partnered with Spotify to offer Home Minis as a free promotion for Spotify Premium customers. Spotify’s premium userbase is nearly 90 million, so if even a fraction of users take the free offer, a massive influx of Google smart speakers will enter the market.”).

THE PARTIES

43. Plaintiff Sonos, Inc. is a Delaware corporation with its principal place of business at 614 Chapala Street, Santa Barbara, California 93101. Sonos is the owner of the patents-in-suit. Sonos holds all substantial rights, title and interest in and to the Asserted Patents.

44. Defendant Google LLC is a Delaware limited liability corporation with its principal place of business at 1600 Amphitheatre Parkway, Mountain View, CA 94043. Google maintains a physical address in this district at 500 West 2nd Street, Austin, Texas, 78701. Google may be served with process through its registered agent, the Corporation Service Company, at 211 East 7th Street, Suite 620, Austin Texas 78701. Google is registered to do business in the State of Texas and has been since at least November 17, 2006.

45. Google LLC is one of the largest technology companies in the world and conducts product development, engineering, sales, and online retail, search, and advertising operations in this District.

46. Google LLC directly and/or indirectly develops, designs, manufactures, distributes, markets, offers to sell, sells, and/or imports the infringing Google Wireless Audio System at issue in this litigation in/into the United States, including in the Western District of Texas, and otherwise purposefully directs infringing activities to this District in connection with its Google Wireless Audio System.

JURISDICTION AND VENUE

47. This action for patent infringement arises under the Patent Laws of the United States, 35 U.S.C. § 1 et. seq. This Court has original jurisdiction under 28 U.S.C. §§ 1331 and 1338.

48. This Court has personal jurisdiction over Google because, pursuant to Fed. R. Civ. P. 11(b)(3), Google has: (1) availed itself of the rights and benefits of the laws of the State of Texas, (2) transacted, conducted, and/or solicited business and engaged in a persistent course of conduct in the State of Texas (and in this District), (3) derived substantial revenue from the sales and/or use of products, such as the infringing Google Wireless Audio System, in the State of Texas (and in this District), (4) purposefully directed activities (directly and/or through intermediaries), such as shipping, distributing, offering for sale, selling, and/or advertising its infringing Google Wireless Audio System, at residents of the State of Texas (and residents in this District), (5) delivered its infringing Google Wireless Audio System into the stream of commerce with the expectation that the Google Wireless Audio System will be used and/or purchased by consumers, and (6) committed acts of patent infringement in the State of Texas (and in this District).

49. This Court also has personal jurisdiction over Google because it is registered to do business in the State of Texas and has one or more regular and established places of business in the Western District of Texas.

50. Venue is proper in this District under the provisions of 28 U.S.C. § 1400(b) because, as noted above, Google has committed acts of infringement in this district and has one or more regular and established places of business in this district. Google has also repeatedly admitted that venue is proper in this District for various patent cases. *See e.g., Solas OLED Ltd. v. Google, Inc.* (WDTX Case No. 6-19-cv-00515) and *VideoShare, LLC v. Google LLC et al* (WDTX Case No. 6-19-cv-00663).

THE PATENTS-IN-SUIT

U.S. Patent No. 9,967,615

51. Sonos is the owner of U.S. Patent No. 9,967,615 (the “’615 Patent”), entitled “Networked Music Playback,” which was duly and legally issued by the United States Patent and Trademark Office (“USPTO”) on May 8, 2018. A copy of the ’615 Patent, is attached hereto as Exhibit 1.

52. The ’615 Patent relates generally to technology for facilitating transfer of playback responsibility from a user’s device to a media playback system.

53. The ’615 Patent recognized that “[t]echnological advancements have increased the accessibility of music content, as well as other types of media....” ’615 Patent at 1:19-20. This allowed users to access audio and video content over the Internet. *Id.* at 1:21-26.

54. But, the ’615 Patent identified a particular problem and provided an unconventional technological solution. Specifically, the patent recognized that “[w]ired or wireless networks can be used to connect one or more multimedia playback devices for a home or other location playback network (*e.g.*, a home music system).” ’615 Patent at 1:66-2:2. This means that “[m]usic and/or other multimedia content can be shared among devices and/or groups of devices (also referred to herein as zones) associated with a playback network.” *Id.* at 2:6-9. The ’615 Patent is directed to a method, tangible media, and controller that “facilitate streaming or otherwise providing music from a music-playing application (*e.g.*, browser-based application, native music player, other multimedia application, and so on) to a multimedia content playback (*e.g.*, SonosTM) system.” *Id.* at 2:10-14.

55. The ’615 Patent provides an unconventional technological solution to this problem. For example, the ’615 Patent describes an “Example Controller” that “can be used to facilitate the control of multi-media applications....” ’615 Patent at 9:8-14. “In particular, the controller 500 is configured to facilitate a selection of a plurality of audio sources available on the network and enable control of one or more zone players ... through a wireless network interface 508.” *Id.* at 9:14-18. Further, the ’615 Patent describes embodiments that “enable a user to stream

music from a music-playing application (e.g., browser-based application, native music player, other multimedia application and so on) to a local multimedia content playback (e.g., Sonos™) system.” ’615 Patent at 12:8-12. More specifically, the ’615 Patent teaches that while “a user listens to a third party music application (e.g., Pandora™ Rhapsody™, Spotify™, and so on)” on a user device, such as the user’s “smart phone,” the user can “select[] an option to continue playing [the current] channel on her household music playback system (e.g., Sonos™),” which will cause the user’s “playback system” to “pick[] up from the same spot on the selected channel that was on her phone and output[] that content (e.g., that song) on speakers and/or other playback devices connected to the household playback system.” *Id.* at 12:44-53; *see also id.* at 13:1-53.

56. The ’615 Patent goes on to teach specific technology for facilitating this transfer of playback responsibility from the user’s device to the user’s playback system. For instance, the ’615 Patent teaches that one aspect of this technology involves causing data for retrieving network-based media content (such as a uniform resource locator (URI)) to be passed to a playback device in the playback system so that the playback device can “run on its own to fetch the content” from a networked audio source, such as a “cloud” server that is accessible over the Internet. *Id.* at 12:53-63; *see also id.* at 12:63-67 (describing that “[a] third party application can open or utilize an application programming interface (API) to pass music to the household playback system without tight coupling to that household playback system”); 15:47-16:19 (describing a “throw it over the wall” approach in which “a third party application provides a multimedia playback device (e.g., a Sonos™ zone player (ZP)) with enough information about content (e.g., an audio track) so that . . . the local playback system (e.g., SonosNet™) can directly access a source of the content and . . . play the content directly off the network (e.g., the Internet) or cloud,” where the “connection between the third-party application and the local playback device (e.g., Sonos ZonePlayer™) can be direct over a local area network (LAN)” or “remote through a proxy server in the cloud”); 16:53-17:4 (describing various embodiments for “queue management” associated with the transfer of playback from a control device to a playback system, including an embodiment where a “shared queue is provided between the local playback system

and the third party application to keep the local system and the application synchronized”). Further, the ’615 Patent teaches that another aspect of this technology involves transitioning the user’s device into a mode in which it functions to control the playback of the media content by the user’s playback system after the transfer. *Id.* at 16:20-42, 17:5-20. In this way, the technology taught by the ’615 Patent provides for intuitive and seamless transfer of playback responsibility from a user’s device to a media playback system.

57. In line with these teachings, the ’615 Patent claims devices, computer-readable media, and methods for facilitating transfer of playback responsibility from a user’s device to a media playback system.

58. For example, claim 13 of the ’615 Patent recites a non-transitory computer readable storage medium including instructions for execution by a processor that, when executed, cause a control device to perform various functions that facilitate transfer of playback responsibility from the device to a media playback system. *See* ’615 Patent, claim 13. When the instructions are executed, the control device is initially operable to (i) cause a graphical interface to display a control interface including one or more transport controls to control playback by the control device, (ii) identify playback devices connected to a local area network, (iii) cause the graphical interface to display a selectable option for transferring playback from the control device, and (iv) detect a set of inputs to transfer playback from the control device to a particular playback device. *Id.* Additionally, the instructions configure the control device so that, after detecting the set of inputs to transfer playback from the control device to the particular playback device, the control device is operable to cause playback to be transferred from the control device to the particular playback device by (a) causing one or more first cloud servers to add multimedia content to a local playback queue on the particular playback device, wherein adding the multimedia content to the local playback queue comprises the one or more first cloud servers adding, to the local playback queue, one or more resource locators corresponding to respective locations of the multimedia content at one or more second cloud servers of a streaming content service, (b) causing playback at the control device to be stopped, and (c) modifying the one or

more transport controls of the control interface to control playback by the playback device. *Id.* Additionally yet, the instructions configure the control device so that the control device is operable to cause the particular playback device to play back the multimedia content, which involves the particular playback device retrieving the multimedia content from one or more second cloud servers of a streaming content service and playing back the retrieved multimedia content. *Id.*

U.S. Patent No. 10,779,033

59. Sonos is the owner of U.S. Patent No. 10,779,033 (the “’033 Patent”), entitled “Systems And Methods For Networked Music Playback,” which was duly and legally issued by the United States Patent and Trademark Office (“USPTO”) on September 15, 2020. A copy of the ’966 Patent, is attached hereto as Exhibit 2.

60. The ’033 Patent is related to the ’615 Patent in that they are both continuations of application No. 13/341,237, filed on December 30, 2011, now U.S. Patent No. 9,654,821. Thus, the ’033 and ’615 Patents share essentially the same specification. Sonos incorporates by reference and re-alleges paragraphs 52-58 of this Complaint as if fully set forth herein.

61. Like the ’615 Patent, the ’033 Patent claims devices, computer-readable media, and methods for facilitating transfer of playback responsibility from a user’s device to a media playback system, which provide an unconventional solution to the technological problem described in the ’615 Patent.

62. For example, claim 1 of the ’033 Patent recites a computing device with specific hardware configurations, including a non-transitory computer-readable medium that stores program instruction that can be executed by the device’s processor(s). *See* ’033 Patent, claim 1. When the instructions are executed, the computing device can initially operate in a first mode in which it is configured for playback of a remote playback queue provided by a cloud-based computing system associated with a cloud-based media service. *Id.* In that mode, the computing device is operable to (i) display a representation of one or more playback devices in a media playback system that are communicatively coupled to the computing device over a data network and available to accept playback responsibility for the remote playback queue, and (ii) while

displaying the representation of the one or more playback devices, receive user input indicating a selection of at least one given playback device from the one or more playback devices. *Id.* Additionally, the instructions configure the computing device so that, based on receiving the user input, the computing device is operable to transmit an instruction for the at least one given playback device to take over responsibility for playback of the remote playback queue from the computing device, wherein the instruction configures the at least one given playback device to (i) communicate with the cloud-based computing system in order to obtain data identifying a next one or more media items that are in the remote playback queue, (ii) use the obtained data to retrieve at least one media item in the remote playback queue from the cloud-based media service; and (iii) play back the retrieved at least one media item. *Id.* Additionally yet, the instructions configure the computing device so that the computing device is operable to detect an indication that playback responsibility for the remote playback queue has been successfully transferred from the computing device to the at least one given playback device, and then after detecting the indication, transition from (a) the first mode in which the computing device is configured for playback of the remote playback queue to (b) a second mode in which the computing device is configured to control the at least one given playback device's playback of the remote playback queue and the computing device is no longer configured for playback of the remote playback queue. *Id.*

U.S. Patent No. 9,344,206

63. Sonos is the owner of U.S. Patent No. 9,344,206 (the "'206 Patent"), entitled "Method And Apparatus For Updating Zone Configurations In A Multi-Zone System," which was duly and legally issued by the United States Patent and Trademark Office ("USPTO") on May 17, 2016. A copy of the '206 Patent, is attached hereto as Exhibit 3.

64. The '206 Patent relates generally to consumer electronics and human-computer interaction and, more specifically, to controlling or manipulating a plurality of multimedia players in a multi-zone system. *See, e.g.,* '206 Patent at 1:25-29.

65. The '206 Patent recognized that users demand not only quality audio reproduction but also a system that allows multiple players to access music from different sources. '206 Patent at 1:30-40. Before the '206 Patent, a conventional multi-zone audio system might include a number of audio sources, but each audio source had to be connected to its own amplifier and a set of speakers and was typically installed in one place. *Id.* at 1:40-44. This had inherent limitations. "In order to play an audio source at one location, the audio source must be provided locally or from a centralized location. When the audio source is provided locally, the multi-zone audio system functions as a collection of many stereo systems, making source sharing difficult. When the audio source is provided centrally, the centralized location may include a juke box, many compact discs, an AM or FM radio, tapes, or others. To send an audio source to an audio player demanding such source, a cross-bar type of device is used to prevent the audio source from going to other audio players that may be playing other audio sources." *Id.* at 1:44-44.

66. Moreover, as the '206 Patent recognized, "[i]n order to achieve playing different audio sources in different audio players, the traditional multi-zone audio system is generally either hard-wired or controlled by a pre-configured and pre-programmed controller." '206 Patent at 1:56-59. Such a system created problems. "While the pre-programmed configuration may be satisfactory in one situation, it may not be suitable for another situation. For example, a person would like to listen to broadcast news from his/her favorite radio station in a bedroom, a bathroom and a den while preparing to go to work in the morning. The same person may wish to listen in the den and the living room to music from a compact disc in the evening. In order to satisfy such requirements, two groups of audio players must be established. In the morning, the audio players in the bedroom, the bathroom and the den need to be grouped for the broadcast news. In the evening, the audio players in the den and the living room are grouped for the music. Over the weekend, the audio players in the den, the living room, and a kitchen are grouped for party music. Because the morning group, the evening group and the weekend group contain the den, it can be difficult for the traditional system to accommodate the requirement of dynamically managing the ad hoc creation and deletion of groups." *Id.* at 1:59-2:10.

67. Thus, the '206 Patent recognized “a need for dynamic control of the audio players as a group” and a system in which “the audio players may be readily grouped.” '206 Patent at 2:11-13. The invention of the '206 Patent would, thus, overcome the problems “in a traditional multi-zone audio system [where] the audio players have to be adjusted one at a time, resulting in an inconvenient and non-homogenous audio environment.” *Id.* at 2:13-16.

68. The '206 Patent provided an unconventional solution to this technological problem. “In general, the present invention pertains to controlling a plurality of multimedia players, or simply players, in groups.” '206 Patent at 2:28-29. One specific aspect of the grouping technology that is taught by the '206 Patent involves a controller with a user interface that permits a user to configure and save a “zone scene,” which may comprise a “predefined” grouping of zone players that can later be “activated” (or “invoked”) in order to group the zone players in the “zone scene” together for synchronous playback. *Id.* at 2:30-53, 2:60-3:4, 8:19-10:45. The '206 Patent explains that this “zone scene” technology for grouping zone players together for synchronous playback provides improvements over the existing technology for grouping zone players together for synchronous playback, which involved defining the group membership at the time that the group was to be invoked – particularly in situations where a larger number of zone players are to be grouped together for synchronous playback. *Id.* at 8:19-55. For instance, the benefits highlighted by the '206 Patent include (i) allowing a group of zone players to be “predefined” as part of a “zone scene” so that the group’s membership need not be defined at the time that the group is to be invoked, (ii) allowing a predefined group to be invoked without requiring the zone players in the group to be separated from other groups beforehand, and (iii) allowing zone players to exist as part of multiple different predefined groups that can be invoked in order to dynamically group the zone players for synchronous playback. *Id.* at 8:19-10:45.

69. In line with these teachings, the '206 Patent claims devices, computer-readable media, and methods for managing and using “zone scenes” to facilitate grouping of zone players. For example, claim 1 of the '206 Patent recites a “multimedia controller including a processor” that is configured to (i) receive, via a network interface, a zone configuration from a first

independent playback device of a plurality of independent playback devices, wherein the zone configuration is configured via the controller and maintained at the first independent playback device, and wherein the zone configuration characterizes one or more zone scenes, each zone scene identifying a group configuration associated with two or more of the plurality of independent playback devices, and (ii) cause a selectable indication of the received zone configuration to be displayed, wherein the displayed selectable indication is selectable to cause one or more of the zone scenes to be invoked by two or more of the plurality of independent playback devices. *See* '206 Patent, claim 1.

U.S. Patent No. 10,469,966

70. Sonos is the owner of U.S. Patent No. 10,469,966 (the “’966 Patent”), entitled “Zone Scene Management,” which was duly and legally issued by the United States Patent and Trademark Office (“USPTO”) on November 5, 2019. A copy of the ’966 Patent, is attached hereto as Exhibit 4.

71. The ’966 Patent is related to the ’206 Patent in that they are both continuations of application No. 13/896,829, filed on May 17, 2013, now U.S. Patent No. 8,843,228. Thus, the ’966 and ’206 Patents share essentially the same specification. Sonos incorporates by reference and re-alleges paragraphs 64-69 of this Complaint as if fully set forth herein.

72. The ’906 Patent claims devices, computer-readable media, and methods for managing and using “zone scenes” to facilitate grouping of zone players, which provides an unconventional solution to the technological problems related to grouping zone players that are described in the ’906 Patent.

73. For example, claim 1 of the ’966 Patent describes a computing device with a processor that can execute instructions stored in the controllers non-transitory, computer-readable medium. Those instructions, when executed, cause the computing device to be operable to (i) receive a first request to create a first zone scene comprising a first predetermined grouping of zone players that are to be configured for synchronous playback when the first zone scene is invoked, and (ii) based on the first request, cause creation of the first zone scene, cause an

indication of the first zone scene to be transmitted to a first zone player in the first zone scene, and cause storage of the first zone scene. *See, e.g.*, '966 Patent, claim 1. Additionally, the instructions, when executed, cause the computing device to be operable to (i) receive a second request to create a second zone scene comprising the first zone player and at least one other zone player that is not in the first zone scene, and (ii) based on the second request, cause creation of the second zone scene, cause an indication of the second zone scene to be transmitted to the first zone player, and cause storage of the second zone scene. *Id.* Additionally yet, the instructions, when executed, cause the computing device to be operable to (i) display representations of the first and second zone scenes, (ii) while displaying the representations, receive a third request to invoke the first zone scene, and (iii) based on the third request, cause the first zone player to transition from operating in a standalone mode to operating in accordance with the first predefined grouping of zone players so that the first zone player is configured to coordinate with at least the second zone player to output media in synchrony with output of media by at least the second zone player. *Id.*

U.S. Patent No. 9,219,460

74. Sonos is the owner of U.S. Patent No. 9,219,460 (the "'460 Patent"), entitled "Audio Settings Based on Environment," which was duly and legally issued by the United States Patent and Trademark Office ("USPTO") on December 22, 2015. A copy of the '460 Patent, is attached hereto as Exhibit 5.

75. The '460 Patent relates generally to "consumer goods and, more particularly, to methods, systems, products, features, services, and other elements directed to media playback or some aspect thereof." '460 Patent at 1:6-9. More specifically, the '460 Patent is directed to dynamically adjusting the equalization of a playback device based on the environment in which the playback device is operating. *See, e.g., id.* at 1:64-66.

76. The '460 Patent recognized that "[w]hile a playback device may be factory configured to perform advantageously in a typical operating environment, the factory configuration may not be ideal for all environments." '460 Patent at 1:66-2:2. According to the

'460 Patent, "adjusting the equalization of the playback device based on the current operating environment may improve the listening experience for some listeners." *Id.* at 2:3-5.

77. The '460 Patent recognized that there are several problems with existing technology for adjusting an audio player's equalization. '460 Patent at 2:12-14. For instance:

First, the adjustment process is often overlooked by the user because, for example, the user may be required to initiate the adjustment and position the microphone. Second, the adjustment process requires a separate microphone, which may not be included with any of the components of the audio system. Third, the manual approach does not lend itself to frequent adjustment when one or more of the speakers may be re-positioned in different locations throughout a home or outdoors.

Id. at 2:23-32.

78. The '460 Patent provides an unconventional technological solution to these problems. For example, the '460 Patent discloses a playback device that "emit[s] an audio signal, such as a pulse, . . . [which] may encounter various objects, such as walls and furniture, throughout the environment." '460 Patent at 2:37-42. The '460 Patent further discloses that "[w]hen an object is encountered, the object may variably reflect or absorb portions of the audio signal," and "[a]t some point, a portion of the reflected audio signal may reflect back toward the playback device from which the audio signal was emitted." *Id.* at 2:42-50. According to the '460 Patent, "[t]he microphone of the playback device may then detect at least a portion of the reflected audio signal," and "[i]n response to detecting the reflected audio signal, the playback device may determine one or more reflection characteristics based on the reflected audio signal." *Id.* at 2:50-55. Moreover, the '460 Patent discloses that "[t]he playback device may then adjust an equalization setting of the playback device based on the one or more reflection characteristics," and "[o]nce the equalization setting is adjusted, the playback device may then play an audio track according to the equalization setting." *Id.* at 3:6-26.

79. In line with these teachings, the '460 Patent claims devices, systems, and methods for dynamically adjusting the equalization of a playback device based on the environment in which the playback device is operating, which provide an unconventional solution to the technological problems described in the '460 Patent. For example, claim 15 of the '460 Patent

describes a playback device with a speaker, a microphone that is physically coupled to the speaker, a processor, a network interface, a data storage, and a program logic stored in the data storage and executable by the processor. The program logic, when executed, causes the playback device to be operable to (i) emit a first audio signal from the speaker, and (ii) detect a second audio signal via the microphone that is physically coupled to the speaker, where at least a portion of the second audio signal is a reflection of the first audio signal. *See* '460 Patent, claim 15. Additionally, the program logic, when executed, causes the playback device to be operable to (i) in response to detecting the second audio signal, determine a first reflection characteristic based on at least the second audio signal, (ii) adjust an equalization setting of the playback device based on at least the first reflection characteristic, and (iii) play, via the speaker, an audio track according to the adjusted equalization setting. *Id.*

COUNT I: INFRINGEMENT OF U.S. PATENT NO. 9,967,615

80. Sonos incorporates by reference and re-alleges paragraphs 1-79 of this Complaint as if fully set forth herein.

81. Google and/or users of the Google Wireless Audio System have directly infringed (either literally or under the doctrine of equivalents) and continue to directly infringe one or more of the claims of the '615 Patent, in violation of 35 U.S.C. § 271(a), by making, using, offering for sale, and/or selling the Google Wireless Audio System within the United States and/or importing the Google Wireless Audio System into the United States without authority or license.

82. As just one non-limiting example, set forth below is an exemplary infringement claim chart for claim 13 of the '615 Patent in connection with the Google Wireless Audio System. This claim chart is based on publicly available information. Sonos reserves the right to modify this claim chart, including, for example, on the basis of information about the Google Wireless Audio System that it obtains during discovery.

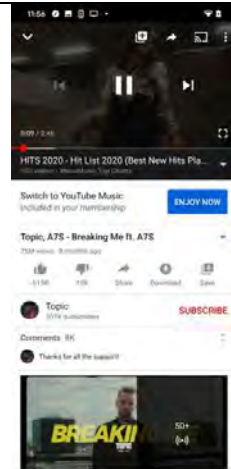
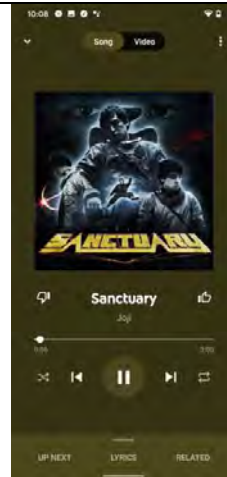
Claim: 13	Chromecast-Enabled Computing Devices
A tangible, non-transitory computer readable storage	At least each smartphone, tablet, and computer running the YouTube Music app, the Google Play Music app, the YouTube app and/or other native or web-based Chromecast-enabled apps (where a computing

<p>medium including instructions for execution by a processor, the instructions, when executed, cause a control device to implement a method comprising:</p>	<p>device installed with at least one of these Chromecast-enabled apps is referred to herein as a “Chromecast-enabled computing device”^{1,2}) comprises a “control device,” as recited in claim 13. At least each Home Mini, Nest Mini, Home, Home Max, Home Hub, Nest Hub, Nest Hub Max, Nest Wifi Point, Chromecast, Chromecast Audio, Chromecast Ultra, Chromecast with Google TV, and Nest Audio (“Chromecast-enabled media player”) is a data network device configured to process and output audio, and thus, comprises a “playback device” as recited in claim 13. <i>See, e.g.,</i> https://store.google.com/us/magazine/compare_pixel; https://store.google.com/us/product/google_pixelbook_specs; https://store.google.com/us/product/pixel_slate_specs; https://store.google.com/us/product/google_home_max?hl=en-US; https://store.google.com/us/product/google_home_max_partners?hl=en-US; https://store.google.com/product/chromecast_apps?utm_source=chromecast.com.</p> <p>In addition to being a “playback device” as recited in claim 13, each Home Hub, Nest Hub, and Nest Hub Max (referred to herein as a “Hub media player”) is installed with Home/Nest Hub controller software such that the given Hub media player also comprises a “control device,” as recited in claim 13. <i>See, e.g.,</i> https://store.google.com/us/product/google_nest_hub?hl=en-US#overview-modal-music; https://store.google.com/us/product/google_nest_hub_max?hl=en-US; https://support.google.com/googlenest/answer/9165738?hl=en-GB&ref_topic=7030084.</p> <p>Each Chromecast-enabled computing device includes a tangible, non-transitory computer-readable storage medium comprising instructions that, when executed by a Chromecast-enabled computing device’s processor, cause that Chromecast-enabled computing device to perform the functions identified below. <i>See, e.g.,</i> https://store.google.com/us/magazine/compare_pixel; https://store.google.com/us/product/google_pixelbook_specs; https://store.google.com/us/product/pixel_slate_specs. Likewise, each</p>
--	---

¹ Any reference to a “Chromecast-enabled computing device” or “Chromecast-enabled media player” includes each version and generation of such device/player unless otherwise noted.

² Each Google “Pixel” smartphone, tablet, and computer (*e.g.*, the Pixel 3, Pixel 3 XL, Pixel 3a, Pixel 3a XL, Pixel 4, Pixel 4 XL, and Pixel 4a phones, the Pixel Slate tablet, and the Pixelbook and Pixelbook Go laptops) running the YouTube Music app, the Google Play Music app, the YouTube app, the Google Home app, and/or other native or web-based Chromecast-enabled app is an example of a “Chromecast-enabled computing device.”

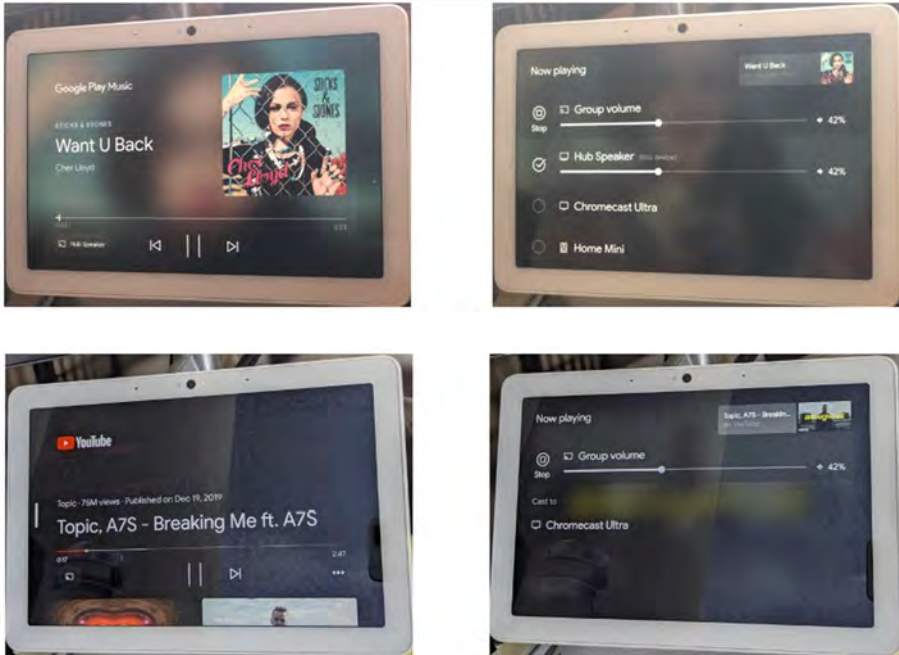
	<p>Hub media player includes a tangible, non-transitory computer-readable storage medium comprising instructions that, when executed by a Hub media player's processor, cause that Hub media player to perform the functions identified below. <i>See, e.g.,</i> https://store.google.com/us/product/google_home_max?hl=en-US.</p>
causing a graphical interface to display a control interface including one or more transport controls to control playback by the control device;	<p>Each Chromecast-enabled computing device comprises instructions that, when executed by a Chromecast-enabled computing device's processor, cause its graphical interface to display a control interface including one or more transport controls to control playback by the Chromecast-enabled computing device.</p> <p>For instance, each Chromecast-enabled computing device is programmed with the capability to cause its graphical interface to display a control interface having one or more transport controls that, at times, are configured to control the Chromecast-enabled computing device's playback of multimedia content from a streaming content service, among other media sources. <i>See, e.g.,</i> https://support.google.com/googlenest/answer/7181830?hl=en-GB&ref_topic=7030084 ("You can even use your mobile device or tablet as a remote and control everything from playback to volume."); https://support.google.com/chromecast/answer/6178107?co=GENIE.Platform%3DAndroid&hl=en ("Using your phone or tablet: [] You can use the playback controls on the Google Play Music app . . . Using your computer: [] You can use the playback controls on Google Play Music, near the bottom of the screen."); https://support.google.com/chromecast/answer/2995235?hl=en-AU; https://support.google.com/googlenest/answer/7030379?co=GENIE.Platform%3DAndroid&hl=en-GB; https://support.google.com/chromecast/answer/3265953?hl=en-GB&ref_topic=4602553. Examples of this functionality are illustrated in the following screenshots from a Chromecast-enabled computing device running at least the YouTube Music, Google Play Music, and YouTube apps:</p>








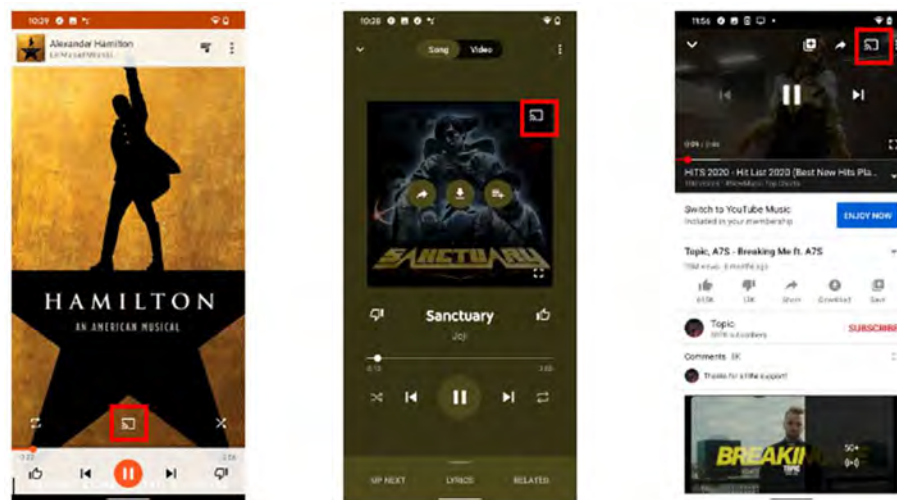
Likewise, each Hub media player comprises instructions that, when executed by a Hub media player's processor, cause its graphical interface to display a control interface including one or more transport controls to control playback by the Hub media player.

For instance, each Hub media player is programmed with the capability to cause its graphical interface to display a control interface having one or more transport controls that, at times, are configured to control the Hub media player's playback of multimedia content from a streaming content service, among other media sources. *See, e.g.,* https://store.google.com/us/product/google_nest_hub?hl=en-US#overview-modal-music ("YouTube Music on demand. . . . Stream top music services."); https://store.google.com/us/product/google_nest_hub_max?hl=en-US ("jam out with YouTube Music."); https://support.google.com/googlenest/answer/9165738?hl=en-GB&ref_topic=7030084 ("With YouTube built-in to your Google Nest display, you can watch YouTube Originals, how-to videos and much more, seamlessly on your screen."). Examples of this functionality are illustrated in the following screenshots from a Hub media player running at least the YouTube Music, Google Play Music, and YouTube apps:




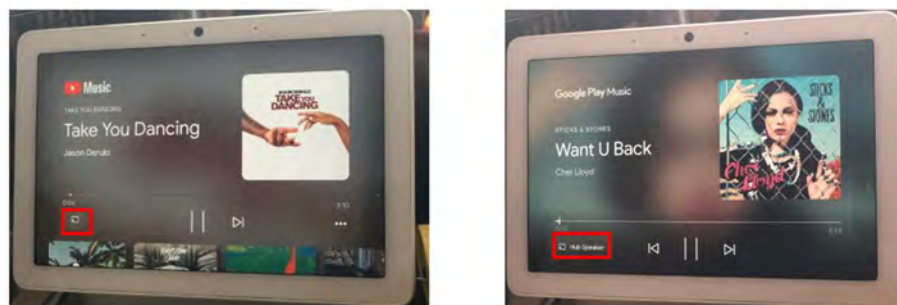
	 <p>The top row shows the Google Play Music interface with the song 'Want U Back' by Cher Lloyd playing. The bottom row shows the YouTube interface with the video 'Topic, A7S - Breaking Me ft. A7S' playing. Both screens show playback controls and a list of available Chromecast devices for casting.</p>
<p>after connecting to a local area network via a network interface, identifying playback devices connected to the local area network;</p>	<p>Each Chromecast-enabled computing device comprises instructions that, when executed by a Chromecast-enabled computing device's processor, cause that Chromecast-enabled computing device to, after connecting to a local area network ("LAN") via a network interface, identify Chromecast-enabled media players connected to the LAN.</p> <p>For instance, each Chromecast-enabled computing device is programmed such that, after connecting to a LAN, the Chromecast-enabled computing device is configured to identify one or more Chromecast-enabled media players connected to that same LAN. <i>See, e.g.,</i> https://support.google.com/googlenest/answer/7181830?hl=en-GB&ref_topic=7030084 ("Make sure that your mobile device or tablet is connected to the same Wi-Fi network or linked to the same account as your Google Nest or Home speaker or display. . . . Tap the speaker or display for which you'd like to cast."); https://support.google.com/chromecast/answer/6178107?co=GENIE.Platform%3DAndroid&hl=en ("Connect your phone or tablet and Chromecast to the same wireless network. . . . Select your Chromecast device from the device list."); https://support.google.com/chromecast/answer/2995235?hl=en-AU ("Make sure that your mobile device or computer is connected to the same Wi-Fi network as Chromecast. . . . Tap the Chromecast device to which you want to cast."); https://support.google.com/chromecast/answer/3228332?hl=en-GB&ref_topic=4602553&co=GENIE.Platform%3DDesktop&oco=1 ("To show Chrome on your TV, you'll need . . . [t]o connect your computer and Chromecast device to the same Wi-Fi network.");</p>

	<p>https://support.google.com/chromecast/answer/3265953?hl=en-GB&ref_topic=4602553.</p> <p>Likewise, each Hub media player comprises instructions that, when executed by a Hub media player's processor, cause that Hub media player to, after connecting to a LAN via a network interface, identify Chromecast-enabled media players connected to the LAN.</p> <p>For instance, each Hub media player is programmed such that, after connecting to a LAN, the Hub media player is configured to identify one or more Chromecast-enabled media players connected to that same LAN. <i>See, e.g.,</i> https://support.google.com/googlenest/answer/9563059?hl=en-GB&ref_topic=7030084 ("At the bottom-left corner of the screen, tap Devices  to see the list of available devices and speaker groups.").</p>
causing the graphical interface to display a selectable option for transferring playback from the control device;	<p>Each Chromecast-enabled computing device comprises instructions that, when executed by a Chromecast-enabled computing device's processor, cause its graphical interface to display a selectable option for transferring playback from the Chromecast-enabled computing device.</p> <p>For instance, each Chromecast-enabled computing device is programmed with the capability to cause its graphical interface to display a selectable option (e.g., a selectable "Cast button") for transferring playback of multimedia content from the Chromecast-enabled computing device to another device (e.g., a Chromecast-enabled media player). <i>See, e.g.,</i> https://support.google.com/googlenest/answer/7181830?hl=en-GB&ref_topic=7030084 ("Tap the Cast button . . . Tap the speaker or display for which you'd like to cast."); https://support.google.com/chromecast/answer/6178107?co=GENIE.Platform%3DAndroid&hl=en ("Tap the Cast button . . . Select your Chromecast device from the device list."); https://support.google.com/chromecast/answer/2995235?hl=en-AU ("Tap the Cast button . . . Tap the Chromecast device to which you want to cast."); https://support.google.com/chromecast/answer/3228332?hl=en-GB&ref_topic=4602553&co=GENIE.Platform%3DDesktop&oco=1 ("2. At the top right, click More  Cast. 3. Choose the Chromecast device where you want to watch the content."); https://support.google.com/chromecast/answer/3265953?hl=en-GB&ref_topic=4602553. Examples of this functionality are illustrated in the following screenshots from a Chromecast-enabled computing device running at least the YouTube Music, Google Play Music, and YouTube apps:</p>



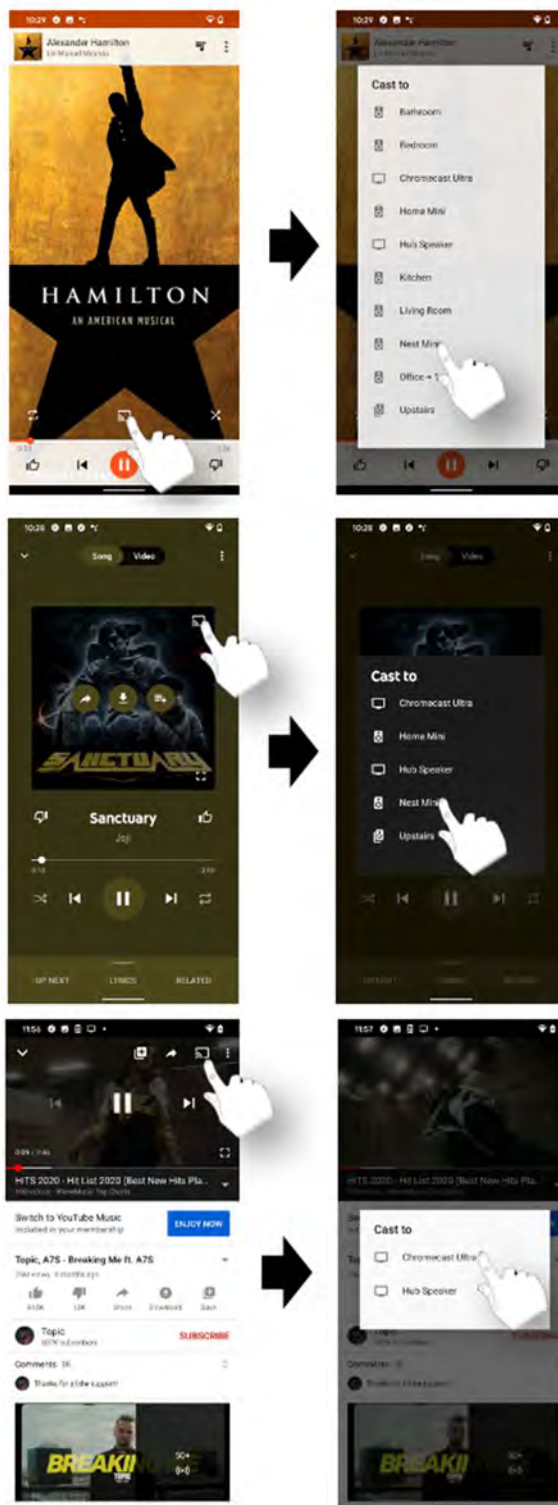
Likewise, each Hub media player comprises instructions that, when executed by a Hub media player's processor, cause its graphical interface to display a selectable option for transferring playback from the Hub media player to another Chromecast-enabled media player.

For instance, each Hub media player is programmed with the capability to cause its graphical interface to display a selectable option (e.g., a selectable "Cast button") for transferring playback of multimedia content from the Hub media player to another device (e.g., a Chromecast-enabled media player). *See, e.g.,* https://support.google.com/googlenest/answer/9563059?hl=en-GB&ref_topic=7030084 ("At the bottom-left corner of the screen, tap Devices  to see the list of available devices and speaker groups. . . . Select the device for which you want to move your media.""). Examples of this functionality are illustrated in the following screenshots from a Hub media player running at least the YouTube Music, Google Play Music, and YouTube apps:




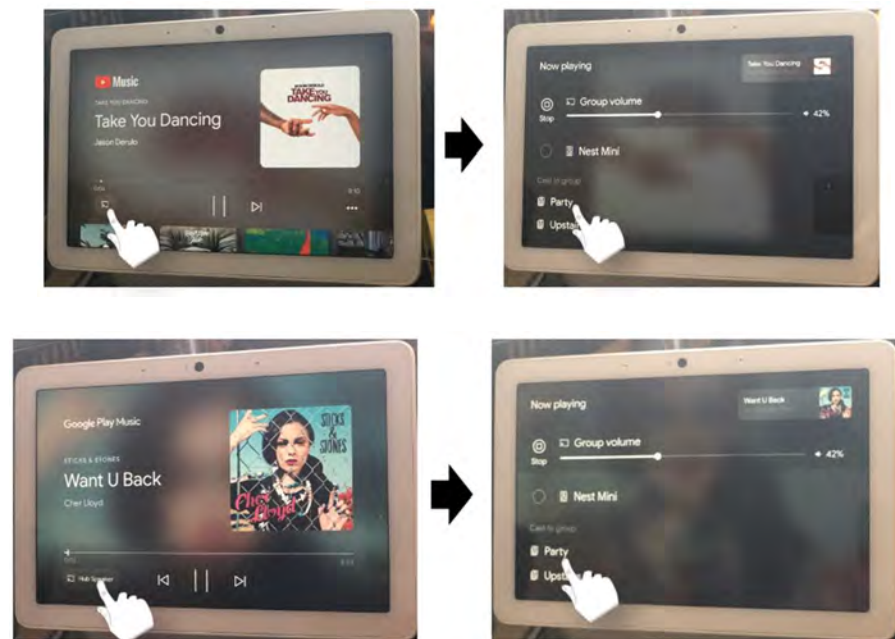
	
<p>detecting a set of inputs to transfer playback from the control device to a particular playback device, wherein the set of inputs comprises: (i) a selection of the selectable option for transferring playback from the control device and (ii) a selection of the particular playback device from the identified playback devices connected to the local area network:</p>	<p>Each Chromecast-enabled computing device comprises instructions that, when executed by a Chromecast-enabled computing device's processor, cause that Chromecast-enabled computing device to detect a set of inputs to transfer playback from the Chromecast-enabled computing device to a particular Chromecast-enabled media player, where the set of inputs comprises: (i) a selection of the selectable option for transferring playback from the Chromecast-enabled computing device and (ii) a selection of the particular Chromecast-enabled media player from the identified Chromecast-enabled media players connected to the LAN.</p> <p>For instance, each Chromecast-enabled computing device is programmed with the capability to (i) detect a selection of a displayed selectable option (e.g., a selectable "Cast button") for transferring playback of multimedia content from the Chromecast-enabled computing device to another device, which triggers the Chromecast-enabled computing device to display a list of available devices for transferring playback that includes one or more identified Chromecast-enabled media players on the same LAN, and then (ii) detect a selection of at least one particular Chromecast-enabled media player connected to the same LAN. <i>See, e.g.,</i> https://support.google.com/googlenest/answer/7181830?hl=en-GB&ref_topic=7030084 ("Tap the Cast button . . . Tap the speaker or display for which you'd like to cast."); https://support.google.com/chromecast/answer/6178107?co=GENIE.Platform%3DAndroid&hl=en ("Tap the Cast button . . . Select your Chromecast device from the device list."); https://support.google.com/chromecast/answer/2995235?hl=en-AU ("Tap the Cast button . . . Tap the Chromecast device to which you want to cast."); https://support.google.com/chromecast/answer/3228332?hl=en-GB&ref_topic=4602553&co=GENIE.Platform%3DDesktop&oco=1 ("2. At the top right, click More  > Cast. 3. Choose the Chromecast device where you want to watch the content."); https://support.google.com/chromecast/answer/3265953?hl=en-GB&ref_topic=4602553. Examples of this functionality are illustrated in the following screenshots from a Chromecast-enabled</p>



computing device running at least the YouTube Music, Google Play Music, and YouTube apps:



Likewise each Hub media player comprises instructions that, when executed by a Hub media player's processor, cause that Hub media player to detect a set of inputs to transfer playback from the Hub media player to a particular Chromecast-enabled media player, where the set of inputs comprises: (i) a selection of the selectable option for transferring playback from the Hub media player and (ii) a selection of the particular Chromecast-enabled media player from the identified Chromecast-enabled media players connected to the LAN.

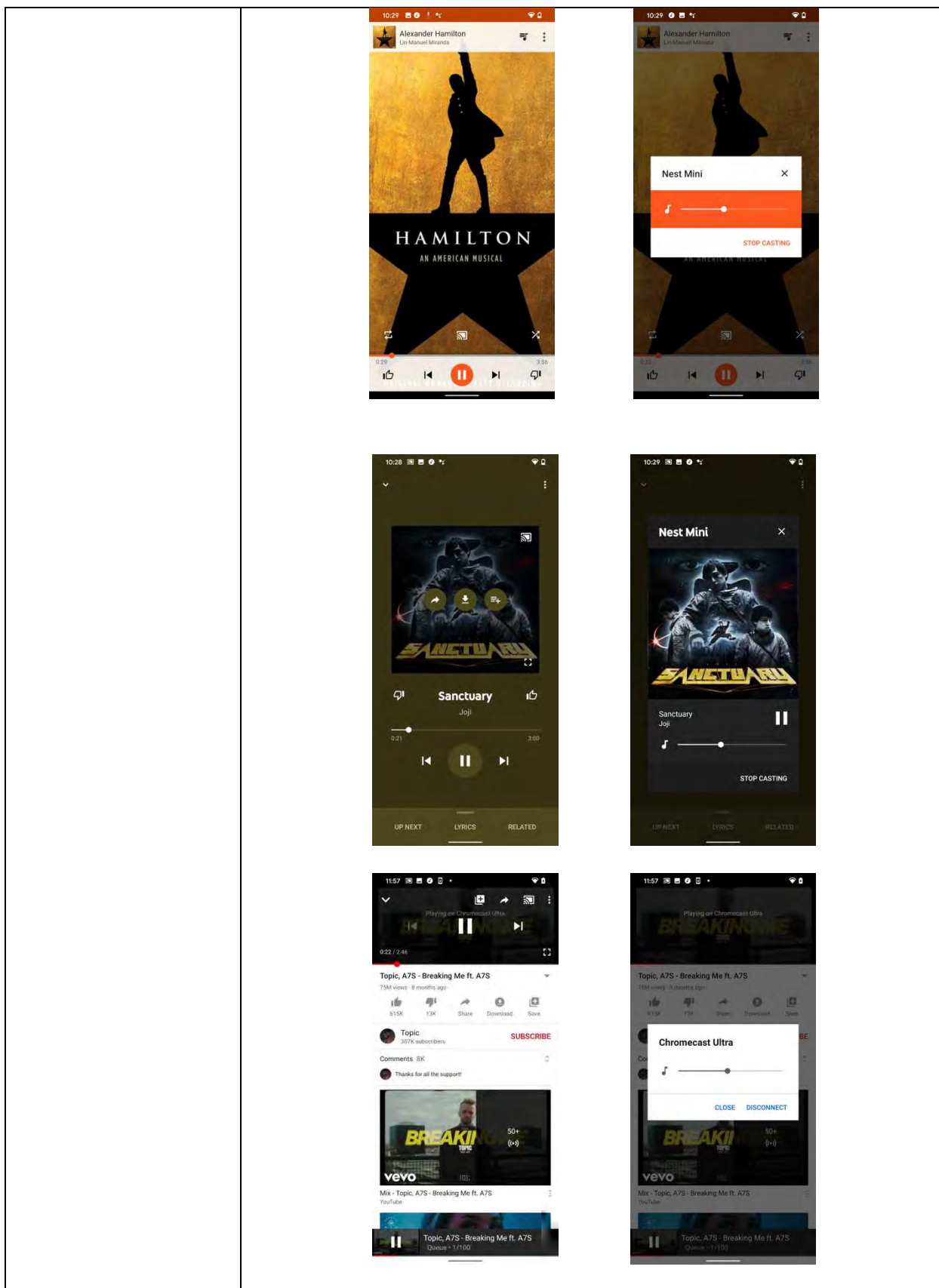
For instance, each Hub media player is programmed with the capability to (i) detect a selection of a displayed selectable option (e.g., a selectable "Cast button") for transferring playback of multimedia content from the Hub media player to another device, which triggers the Hub media player to display a list of available devices for transferring playback that includes one or more identified Chromecast-enabled media players on the same LAN, and then (ii) detect a selection of at least one particular Chromecast-enabled media player connected to the same LAN. *See, e.g.,* https://support.google.com/googlenest/answer/9563059?hl=en-GB&ref_topic=7030084 ("At the bottom-left corner of the screen, tap Devices  to see the list of available devices and speaker groups. . . . Select the device for which you want to move your media.""). Examples of this functionality are illustrated in the following screenshots from a Hub media player running at least the YouTube Music, Google Play Music, and YouTube apps:



	
<p>after detecting the set of inputs to transfer playback from the control device to the particular playback device, causing playback to be transferred from the control device to the particular playback device,</p>	<p>Each Chromecast-enabled computing device comprises instructions that, when executed by a Chromecast-enabled computing device's processor, cause that Chromecast-enabled computing device to, after detecting the set of inputs to transfer playback from the Chromecast-enabled computing device to the particular Chromecast-enabled media player, cause playback to be transferred from the Chromecast-enabled computing device to the particular Chromecast-enabled media player.</p> <p>For instance, each Chromecast-enabled computing device is programmed such that, after detecting a set of inputs to transfer the Chromecast-enabled computing device's playback of multimedia content to at least one particular Chromecast-enabled media player, the Chromecast-enabled computing device causes the playback of the multimedia content to be transferred to the at least one particular Chromecast-enabled media player. <i>See, e.g.,</i> https://support.google.com/googlenest/answer/7181830?hl=en-GB&ref_topic=7030084 ("When you're connected, the Cast button will turn from light to dark grey, letting you know that you're connected."); https://support.google.com/chromecast/answer/3228332?hl=en-GB&ref_topic=4602553&co=GENIE.Platform%3DDesktop&oco=1 ("To the right of the address bar, next to your extensions, you'll see Active cast .</p> <p>https://support.google.com/chromecast/answer/6178107?co=GENIE.Platform%3DAndroid&hl=en; https://support.google.com/chromecast/answer/2995235?hl=en-AU; https://support.google.com/chromecast/answer/3265953?hl=en-GB&ref_topic=4602553.</p> <p>Likewise, each Hub media player comprises instructions that, when executed by a Hub media player's processor, cause that Hub media player to, after detecting the set of inputs to transfer playback from the Hub media player to the particular Chromecast-enabled media player, cause playback to be transferred from the Hub media player to the particular Chromecast-enabled media player.</p> <p>For instance, each Hub media player is programmed such that, after detecting a set of inputs to transfer the Hub media player's playback</p>

	<p>of multimedia content to at least one particular Chromecast-enabled media player, the Hub media player causes the playback of the multimedia content to be transferred to the at least one particular Chromecast-enabled media player. <i>See, e.g.,</i> https://support.google.com/googlenest/answer/9563059?hl=en-GB&ref_topic=7030084.</p>
<p>wherein transferring playback from the control device to the particular playback device comprises: (a) causing one or more first cloud servers to add multimedia content to a local playback queue on the particular playback device, wherein adding the multimedia content to the local playback queue comprises the one or more first cloud servers adding, to the local playback queue, one or more resource locators corresponding to respective locations of the multimedia content at one or more second cloud servers of a streaming content service; (b) causing playback at the control device to be stopped; and (c) modifying the one or more transport controls of the control interface to control playback by the playback device; and</p>	<p>Each Chromecast-enabled computing device and each Hub media player is programmed such that transferring playback to the particular Chromecast-enabled media player comprises: (a) causing one or more first cloud servers to add multimedia content to a local playback queue on the particular Chromecast-enabled media player, where adding the multimedia content to the local playback queue comprises the one or more first cloud servers adding, to the local playback queue, one or more resource locators corresponding to respective locations of the multimedia content at one or more second cloud servers of a streaming content service, (b) causing playback at the Chromecast-enabled computing device (or Hub media player) to be stopped, and (c) modifying the one or more transport controls of the control interface to control playback by the Chromecast-enabled media player.</p> <p>For instance, on information and belief, each Chromecast-enabled computing device and each Hub media player is programmed such that, after detecting a set of inputs to transfer playback of multimedia content from a streaming content service (e.g., Google Play Music, YouTube Music, YouTube, etc.) to at least one particular Chromecast-enabled media player, the respective control device functions to (a) cause a first cloud server associated with the streaming content service (e.g., a first Google cloud server) to add resource locators for such multimedia content to a local playback queue of the particular Chromecast-enabled media player, where the resource locators correspond to locations of the multimedia content at a second cloud server associated with the streaming content service (e.g., a second Google cloud server), (b) stop its own playback of the multimedia content from the streaming content service, and (c) modify one or more transport controls of its control interface such that the one or more transport controls function to control playback by the at least one particular Chromecast-enabled media player rather than playback by the Chromecast-enabled computing device. <i>See, e.g.,</i> https://support.google.com/googlenest/answer/7181830?hl=en-GB&ref_topic=7030084; https://support.google.com/chromecast/answer/6178107?co=GENIE.Platform%3DAndroid&hl=en; https://support.google.com/chromecast/answer/2995235?hl=en-AU; https://support.google.com/googlenest/answer/9563059?hl=en-GB&ref_topic=7030084;</p>

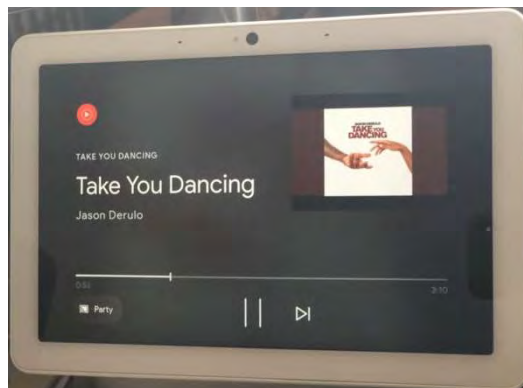
<p>causing the particular playback device to play back the multimedia content, wherein the particular playback device playing back the multimedia content comprises the particular playback device retrieving the multimedia content from one or more second cloud servers of a streaming content service and playing back the retrieved multimedia content.</p>	<p>https://support.google.com/chromecast/answer/3228332?hl=en-GB&ref_topic=4602553&co=GENIE.Platform%3DDesktop&oco=1.</p> <p>Each Chromecast-enabled computing device comprises instructions that, when executed by a Chromecast-enabled computing device's processor, cause the particular Chromecast-enabled media player to play back the multimedia content, where the particular Chromecast-enabled media player playing back the multimedia content comprises the particular Chromecast-enabled media player retrieving the multimedia content from one or more second cloud servers of a streaming content service and playing back the retrieved multimedia content.</p> <p>For instance, on information and belief, each Chromecast-enabled computing device is programmed such that, after causing the Chromecast-enabled computing device's playback of multimedia content from a streaming content service (e.g., Google Play Music, YouTube Music, YouTube, etc.) to be transferred to at least one particular Chromecast-enabled media player, the Chromecast-enabled computing device causes the at least one particular Chromecast-enabled media player to play back the multimedia content from the streaming content service, which involves the particular Chromecast-enabled media player retrieving the multimedia content from the second cloud server associated with the streaming music service (e.g., the Google cloud server) and then playing back the retrieved multimedia content. <i>See, e.g.,</i> https://support.google.com/googlenest/answer/7181830?hl=en-GB&ref_topic=7030084; https://support.google.com/chromecast/answer/6178107?co=GENIE.Platform%3DAndroid&hl=en; https://support.google.com/chromecast/answer/2995235?hl=en-AU; https://support.google.com/chromecast/answer/3228332?hl=en-GB&ref_topic=4602553&co=GENIE.Platform%3DDesktop&oco=1; https://support.google.com/chromecast/answer/3265953?hl=en-GB&ref_topic=4602553. Examples of this functionality are illustrated in the following screenshots from a Chromecast-enabled computing device running at least the YouTube Music, Google Play Music, and YouTube apps:</p>
--	---

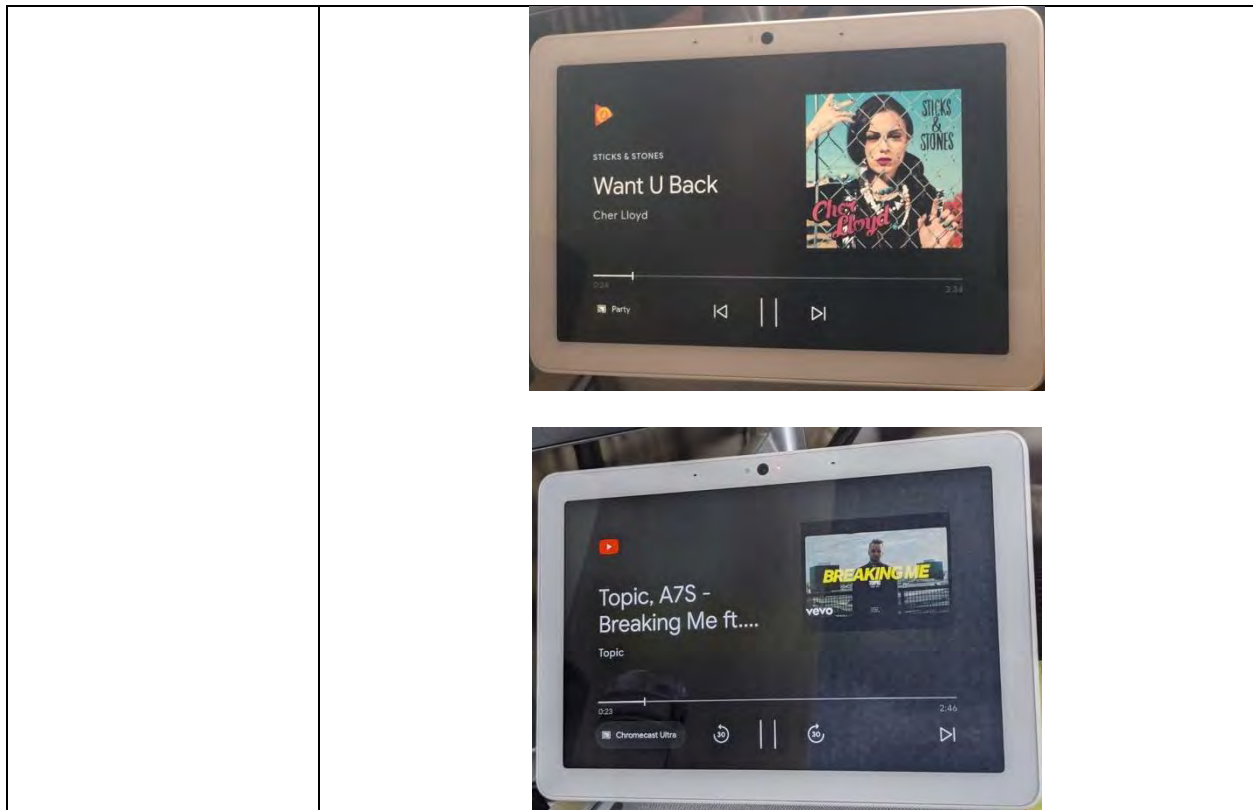


Likewise each Hub media player comprises instructions that, when executed by a Hub media player's processor, cause the particular Chromecast-enabled media player to play back the multimedia content, where the particular Chromecast-enabled media player playing back the multimedia content comprises the particular Chromecast-enabled media player retrieving the multimedia content from one or more second cloud servers of a streaming content service and playing back the retrieved multimedia content.

For instance, on information and belief, each Hub media player is programmed such that, after causing the Hub media player's playback of multimedia content from a streaming content service (e.g., Google Play Music, YouTube Music, YouTube, etc.) to be transferred to at least one particular Chromecast-enabled media player, the Hub media player causes the at least one particular Chromecast-enabled media player to play back the multimedia content from the streaming content service, which involves the particular Chromecast-enabled media player retrieving the multimedia content from the second cloud server associated with the streaming music service (e.g., the second Google cloud server) and then playing back the retrieved multimedia content. *See, e.g.,*

https://support.google.com/googlenest/answer/9563059?hl=en-GB&ref_topic=7030084. Examples of this functionality are illustrated in the following screenshots from a Hub media player running at least the YouTube Music, Google Play Music, and YouTube apps:





83. On September 28, 2020, Sonos provided Google with a draft of this complaint prior to its filing. That draft identified the '615 Patent and described how Google's products infringed. Thus, Google had actual knowledge of Sonos's allegation that Google infringed claims of the '615 Patent prior to Sonos filing the complaint in this action.

84. Additionally and/or alternatively, Google has indirectly infringed and continues to indirectly infringe one or more of the claims of the '615 Patent, in violation of 35 U.S.C. § 271(b), by actively inducing users of the Google Wireless Audio System to directly infringe the one or more claims of the '615 Patent. In particular, (a) Google had actual knowledge of the '615 Patent or was willfully blind to its existence prior to, and no later than, February 2019 and had actual knowledge or was willfully blind to Sonos's infringement allegations at least as early as September 28, 2020 when Sonos provided Google a copy of the complaint (*see* ¶¶ 19-29, above), (b) Google intentionally causes, urges, or encourages users of the Google Wireless Audio System to directly infringe one or more claims of the '615 Patent by promoting, advertising, and instructing customers and potential customers about the Google Wireless Audio System

(including uses thereof) and encouraging such customers and potential customers to engage in activity that constitutes direct infringement (*see* Exs. 22-27; *see also* citations above in the exemplary infringement claim chart for claim 13 of the '615 Patent), (c) Google knows (or should know) that its actions will induce users of the Google Wireless Audio System to directly infringe one or more claims of the '615 Patent, and (d) users of the Google Wireless Audio System directly infringe one or more claims of the '615 Patent. For instance, at a minimum, Google has supplied and continues to supply the YouTube Music, Google Play Music, and YouTube apps to customers while knowing that installation and/or use of one or more of these apps will infringe one or more claims of the '615 Patent, and that Google's customers then directly infringe one or more claims of the '615 Patent by installing and/or using one or more of these apps in accordance with Google's product literature. *See, e.g., id.*

85. Additionally and/or alternatively, Google has indirectly infringed and continues to indirectly infringe one or more of the claims of the '615 Patent, in violation of 35 U.S.C. § 271(c), by offering to sell or selling within the United States, and/or importing into the United States, components in connection with the Google Wireless Audio System that contribute to the direct infringement of the '615 Patent by users of the Google Wireless Audio System. In particular, (a) Google had actual knowledge of the '615 Patent or was willfully blind to its existence prior to, and no later than, February 2019 and had actual knowledge or was willfully blind to Sonos's infringement allegations at least as early as September 28, 2020 when Sonos provided Google a copy of the complaint (*see* ¶¶ 19-29 above), (b) Google offers for sale, sells, and/or imports, in connection with the Google Wireless Audio System, one or more material components of the invention of the '615 Patent that are not staple articles of commerce suitable for substantial noninfringing use, (c) Google knows (or should know) that such component(s) were especially made or especially adapted for use in an infringement of the '615 Patent, and (d) users of devices that comprise such material component(s) directly infringe one or more claims of the '615 Patent. For instance, at a minimum, Google offers for sale, sells, and/or imports the YouTube Music, Google Play Music, and YouTube apps for installation on devices (*e.g.*, smartphones, tablets, and

computers) that meet one or more claims of the '615 Patent. *See, e.g.*, Exs. 22-27. These apps are a material component of the devices that meet the one or more claims of the '615 Patent. Further, Google especially made and/or adapted these apps for installation and use on devices that meet the one or more claims of the '615 Patent, and these apps are not a staple article of commerce suitable for substantial noninfringing use. Google's customers then directly infringe the one or more claims of the '615 Patent by installing and/or using these apps on the customers' devices.

86. Google's infringement of the '615 Patent is also willful because Google (a) had actual knowledge of the '615 Patent no later than February 2019 and actual notice of Sonos's infringement contentions no later than September 28, 2020 (*see* ¶¶ 19-29 above), (b) engaged in the aforementioned activity despite an objectively high likelihood that Google's actions constituted infringement of the '615 Patent, and (c) this objectively-defined risk was either known or so obvious that it should have been known to Google.

87. Additional allegations regarding Google's pre-suit knowledge of the '615 Patent and willful infringement will likely have evidentiary support after a reasonable opportunity for discovery.

88. Sonos is entitled to recover from Google all damages that Sonos has sustained as a result of Google's infringement of the '615 Patent, including, without limitation, a reasonable royalty and lost profits.

89. Google's infringement of the '615 Patent was and continues to be willful and deliberate, entitling Sonos to enhanced damages.

90. Google's infringement of the '615 Patent is exceptional and entitles Sonos to attorneys' fees and costs incurred in prosecuting this action under 35 U.S.C. § 285.

91. Google's infringement of the '615 Patent has caused irreparable harm (including the loss of market share) to Sonos and will continue to do so unless enjoined by this Court.

COUNT II: INFRINGEMENT OF U.S. PATENT NO. 10,779,033

92. Sonos incorporates by reference and re-alleges paragraphs 1-79 of this Complaint as if fully set forth herein.

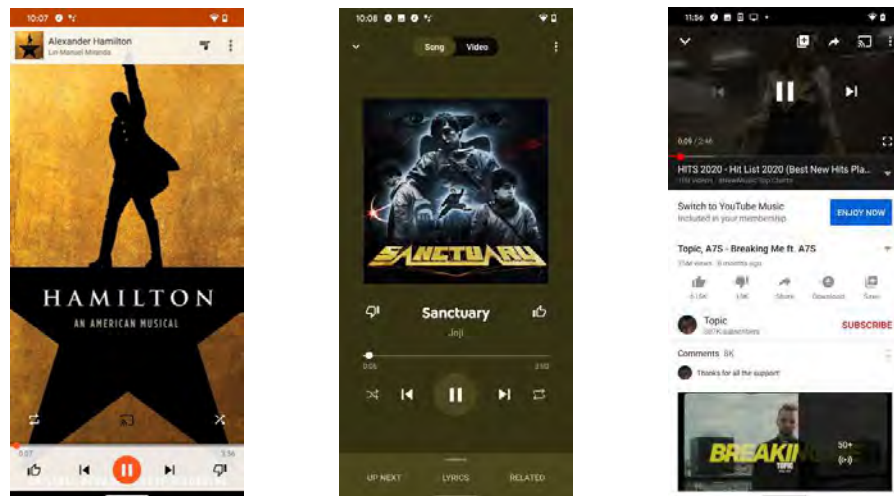
93. Google and/or users of the Google Wireless Audio System have directly infringed (either literally or under the doctrine of equivalents) and continue to directly infringe one or more of the claims of the '033 Patent, in violation of 35 U.S.C. § 271(a), by making, using, offering for sale, and/or selling the Google Wireless Audio System within the United States and/or importing the Google Wireless Audio System into the United States without authority or license.

94. As just one non-limiting example, set forth below is an exemplary infringement claim chart for claim 1 of the '033 Patent in connection with the Google Wireless Audio System. This claim chart is based on publicly available information. Sonos reserves the right to modify this claim chart, including, for example, on the basis of information about the Google Wireless Audio System that it obtains during discovery.

Claim: 1	Chromecast-Enabled Computing Devices
A computing device comprising:	<p>At least each smartphone, tablet, and computer running the YouTube Music app, the Google Play Music app, the YouTube app, and/or other native or web-based Chromecast-enabled apps (where a computing device installed with at least one of these Chromecast-enabled apps is referred to herein as a “Chromecast-enabled computing device”) comprises a “computing device,” as recited in claim 1. At least each Home Mini, Nest Mini, Home, Home Max, Home Hub, Nest Hub, Nest Hub Max, Nest Wifi Point, Chromecast, Chromecast Audio, Chromecast Ultra, Chromecast with Google TV, and Nest Audio (“Chromecast-enabled media player”) is a data network device configured to process and output audio, and thus, comprises a “playback device” as recited in claim 13. <i>See, e.g.,</i> https://store.google.com/us/magazine/compare_pixel; https://store.google.com/us/product/google_pixelbook_specs; https://store.google.com/us/product/pixel_slate_specs; https://store.google.com/us/product/google_home_max?hl=en-US; https://store.google.com/us/product/google_home_max_partners?hl=en-US; https://store.google.com/product/chromecast_apps?utm_source=chromecast.com.</p> <p>In addition to being a “playback device” as recited in claim 1, each Home Hub, Nest Hub, and Nest Hub Max (referred to herein as a “Hub media player”) is installed with Home/Nest Hub controller</p>

	software such that the given Hub media player also comprises a “computing device,” as recited in claim 1. <i>See, e.g.,</i> https://store.google.com/us/product/google_nest_hub?hl=en-US#overview-modal-music ; https://store.google.com/us/product/google_nest_hub_max?hl=en-US ; https://support.google.com/googlenest/answer/9165738?hl=en-GB&ref_topic=7030084 .
at least one processor;	Each Chromecast-enabled computing device and each Hub media player includes at least one processor. <i>See, e.g.,</i> https://store.google.com/us/magazine/compare_pixel ; https://store.google.com/us/product/google_pixelbook_specs ; https://store.google.com/us/product/pixel_slate_specs ; https://store.google.com/us/product/google_home_max?hl=en-US .
a non-transitory computer-readable medium; and	Each Chromecast-enabled computing device and each Hub media player includes a non-transitory computer-readable medium. <i>See, e.g.,</i> https://store.google.com/us/magazine/compare_pixel ; https://store.google.com/us/product/google_pixelbook_specs ; https://store.google.com/us/product/pixel_slate_specs ; https://store.google.com/us/product/google_home_max?hl=en-US .
program instructions stored on the non-transitory computer-readable medium that, when executed by the at least one processor, cause the computing device to perform functions comprising:	Each Chromecast-enabled computing device and each Hub media player includes program instructions stored on the non-transitory computer-readable medium that enable the respective device to perform the functions identified below. <i>See, e.g.,</i> https://store.google.com/us/magazine/compare_pixel ; https://store.google.com/us/product/google_pixelbook_specs ; https://store.google.com/us/product/pixel_slate_specs ; https://store.google.com/us/product/google_home_max?hl=en-US .
operating in a first mode in which the computing device is configured for playback of a remote playback queue provided by a cloud-based computing system associated with a cloud-based media service;	<p>Each Chromecast-enabled computing device comprises instructions that, when executed by a Chromecast-enabled computing device’s processor, cause the Chromecast-enabled computing device to operate in a first mode in which the Chromecast-enabled computing device is configured for playback of a remote playback queue provided by a cloud-based computing system associated with a cloud-based media service.</p> <p>For instance, each Chromecast-enabled computing device is programmed with the capability to operate in a mode in which the Chromecast-enabled computing device is configured for playback of a remote playback queue provided by a Google cloud server associated with a cloud-based media service (e.g., Google Play Music, YouTube Music, YouTube, etc.). <i>See, e.g.,</i> https://support.google.com/googlenest/answer/7181830?hl=en-GB&ref_topic=7030084; https://support.google.com/chromecast/answer/6178107?co=GENIE.P</p>

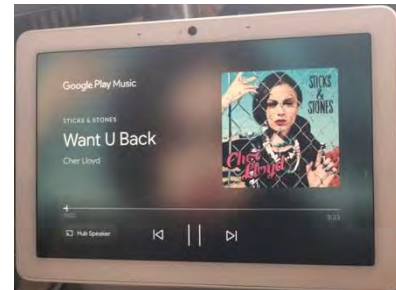
latform%3DAndroid&hl=en;
<https://support.google.com/chromecast/answer/2995235?hl=en-AU>;
https://support.google.com/googlenest/answer/9563059?hl=en-GB&ref_topic=7030084;
https://support.google.com/chromecast/answer/3228332?hl=en-GB&ref_topic=4602553&co=GENIE.Platform%3DDesktop&oco=1;
https://support.google.com/chromecast/answer/3265953?hl=en-GB&ref_topic=4602553. Examples of this functionality are illustrated in the following screenshots from a Chromecast-enabled computing device running at least the YouTube Music, Google Play Music, and YouTube apps:



Likewise, each Hub media player comprises instructions that, when executed by a Hub media player's processor, cause the Hub media player to operate in a first mode in which the Hub media player is configured for playback of a remote playback queue provided by a cloud-based computing system associated with a cloud-based media service.

For instance, each Hub media player is programmed with the capability to operate in a mode in which the Hub media player is configured for playback of a remote playback queue provided by a Google cloud server associated with a cloud-based media service (e.g., Google Play Music, YouTube Music, YouTube, etc.). *See, e.g.*, https://store.google.com/us/product/google_nest_hub?hl=en-US#overview-modal-music ("YouTube Music on demand. . . . Stream top music services."); https://store.google.com/us/product/google_nest_hub_max?hl=en-US ("jam out with YouTube Music."); https://support.google.com/googlenest/answer/9165738?hl=en-GB&ref_topic=7030084 ("With YouTube built-in to your Google Nest display, you can watch YouTube Originals, how-to videos and





much more, seamlessly on your screen.”). Examples of this functionality are illustrated in the following screenshots from a Hub media player running at least the YouTube Music, Google Play Music, and YouTube apps:

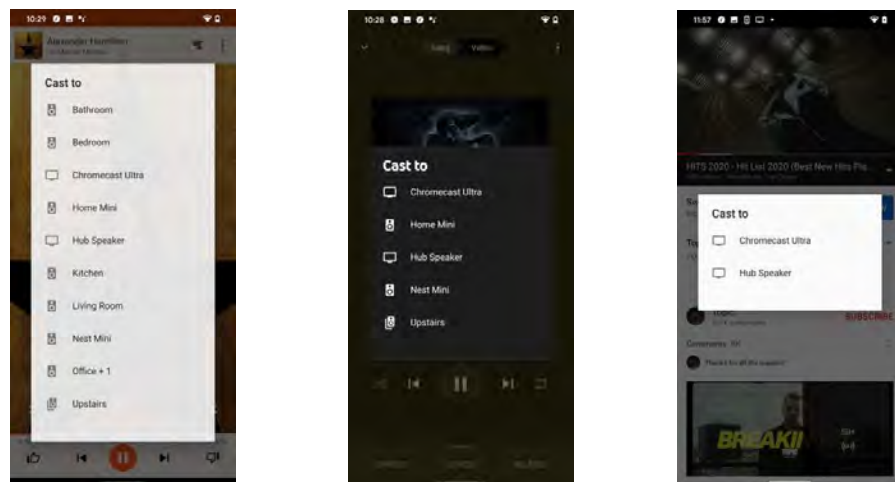


while operating in the first mode, displaying a representation of one or more playback devices in a media playback system that are each i) communicatively coupled to the computing device over a data network and ii) available to accept playback responsibility for the remote playback queue;

Each Chromecast-enabled computing device comprises instructions that, when executed by a Chromecast-enabled computing device's processor, cause the Chromecast-enabled computing device to, while operating in the first mode, display a representation of one or more Chromecast-enabled media players in a Chromecast-enabled playback system that are each (i) communicatively coupled to the Chromecast-enabled computing device over a data network and (ii) available to accept playback responsibility for the remote playback queue.


For instance, each Chromecast-enabled computing device is programmed such that, while operating in a mode in which the Chromecast-enabled computing device is configured for playback of a remote playback queue provided by a Google cloud server associated with a cloud-based media service (e.g., Google Play Music, YouTube Music, YouTube, etc.), the Chromecast-enabled computing device is operable to detect a selection of a displayed selectable option (e.g., a selectable "Cast button") for transferring playback of multimedia content from the Chromecast-enabled computing device to another device, which triggers the Chromecast-enabled computing device to display a list of available devices for transferring playback that includes one or more Chromecast-enabled media players in a Chromecast-enabled playback system that are each (i) communicatively coupled to the Chromecast-enabled computing device over a local area network ("LAN") and (ii) available to accept

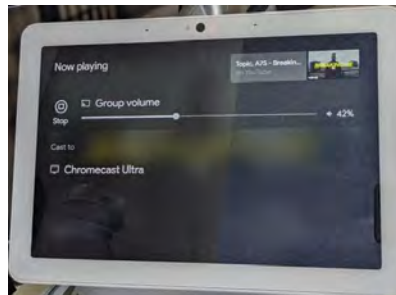
playback responsibility for the remote playback queue. *See, e.g.,* https://support.google.com/googlenest/answer/7181830?hl=en-GB&ref_topic=7030084 (“Tap the Cast button . . . Tap the speaker or display for which you'd like to cast.”); <https://support.google.com/chromecast/answer/6178107?co=GENIE.Platform%3DAndroid&hl=en> (“Tap the Cast button . . . Select your Chromecast device from the device list.”); <https://support.google.com/chromecast/answer/2995235?hl=en-AU> (“Tap the Cast button . . . Tap the Chromecast device to which you want to cast.”); https://support.google.com/chromecast/answer/3228332?hl=en-GB&ref_topic=4602553&co=GENIE.Platform%3DDesktop&oco=1 (“2. At the top right, click More  Cast. 3. Choose the Chromecast device where you want to watch the content.”); https://support.google.com/chromecast/answer/3265953?hl=en-GB&ref_topic=4602553. Examples of this functionality are illustrated in the following screenshots from a Chromecast-enabled computing device running at least the YouTube Music, Google Play Music, and YouTube apps:



Likewise, each Hub media player comprises instructions that, when executed by a Hub media player’s processor, cause the Hub media player to, while operating in the first mode, display a representation of one or more Chromecast-enabled media players in a Chromecast-enabled playback system that are each (i) communicatively coupled to the Hub media player over a data network and (ii) available to accept playback responsibility for the remote playback queue.

For instance, each Hub media player is programmed such that, while operating in a mode in which the Hub media player is configured for playback of a remote playback queue provided by a Google cloud-based computing system associated with a cloud-based media service

(e.g., Google Play Music, YouTube Music, YouTube, etc.), the Hub media player is operable to detect a selection of a displayed selectable option (e.g., a selectable “Cast button”) for transferring playback of multimedia content from the Hub media player to another device, which triggers the Hub media player to display a list of available devices for transferring playback that includes one or more other Chromecast-enabled media players in a Chromecast-enabled playback system that are each (i) communicatively coupled to the Hub media player over a LAN and (ii) available to accept playback responsibility for the remote playback queue. *See, e.g.,* https://support.google.com/googlenest/answer/9563059?hl=en-GB&ref_topic=7030084 (“At the bottom-left corner of the screen, tap Devices  to see the list of available devices and speaker groups. . . . Select the device for which you want to move your media.”). Examples of this functionality are illustrated in the following screenshots from a Hub media player running at least the YouTube Music, Google Play Music, and YouTube apps:

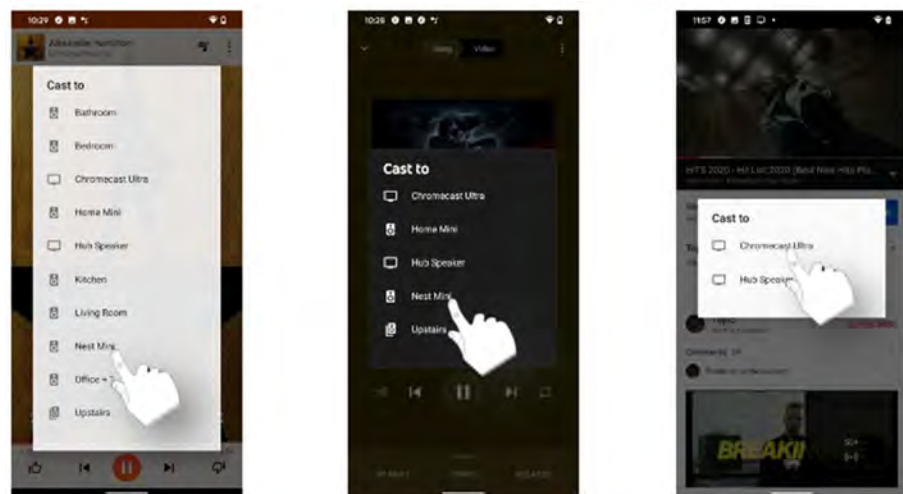


while displaying the representation of the one or more playback devices, receiving user input indicating a selection of at least one given playback device from the one or more playback devices;

Each Chromecast-enabled computing device comprises instructions that, when executed by a Chromecast-enabled computing device’s processor, cause the Chromecast-enabled computing device to, while displaying the representation of the one or more Chromecast-enabled media players, receive user input indicating a selection of at least one given Chromecast-enabled media player from the one or more Chromecast-enabled media players.

For instance, each Chromecast-enabled computing device is programmed such that, while displaying the representation of the one or more Chromecast-enabled media players in a Chromecast-enabled playback system that are each on the same LAN as the Chromecast-

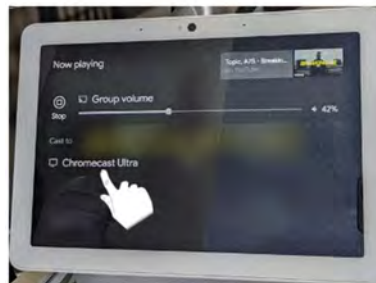
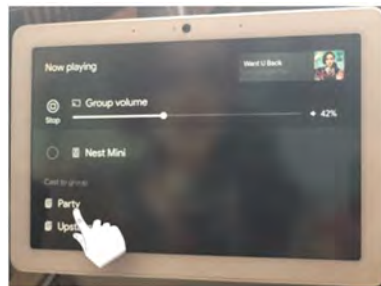
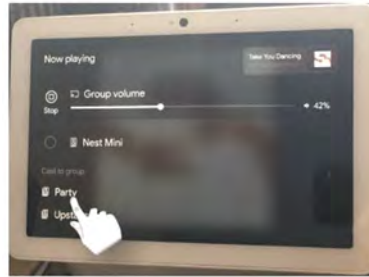
enabled computing device and available to accept playback responsibility for the remote playback queue, the Chromecast-enabled computing device is configured to receive user input indicating a selection of at least one Chromecast-enabled media player in the Chromecast-enabled playback system. *See, e.g.,* https://support.google.com/googlenest/answer/7181830?hl=en-GB&ref_topic=7030084 (“Tap the speaker or display for which you'd like to cast.”); <https://support.google.com/chromecast/answer/6178107?co=GENIE.Platform%3DAndroid&hl=en> (“Select your Chromecast device from the device list.”); <https://support.google.com/chromecast/answer/2995235?hl=en-AU> (“Tap the Chromecast device to which you want to cast.”); https://support.google.com/chromecast/answer/3228332?hl=en-GB&ref_topic=4602553&co=GENIE.Platform%3DDesktop&oco=1 (“Choose the Chromecast device where you want to watch the content.”). Examples of this functionality are illustrated in the following screenshots from a Chromecast-enabled computing device running at least the YouTube Music, Google Play Music, and YouTube apps:



Likewise each Hub media player comprises instructions that, when executed by a Hub media player's processor, cause the Hub media player to, while displaying the representation of the one or more Chromecast-enabled media players, receive user input indicating a selection of at least one given Chromecast-enabled media player from the one or more Chromecast-enabled media players.

For instance, each Hub media player is programmed such that, while displaying the representation of the one or more other Chromecast-enabled media players in a Chromecast-enabled playback system that are each on the same LAN as the Hub media player and available to


accept playback responsibility for the remote playback queue, the Hub media player is configured to receive user input indicating a selection of at least one other Chromecast-enabled media player in the Chromecast-enabled playback system. *See, e.g.,* https://support.google.com/googlenest/answer/9563059?hl=en-GB&ref_topic=7030084 (“Select the device for which you want to move your media.”). Examples of this functionality are illustrated in the following screenshots from a Hub media player:



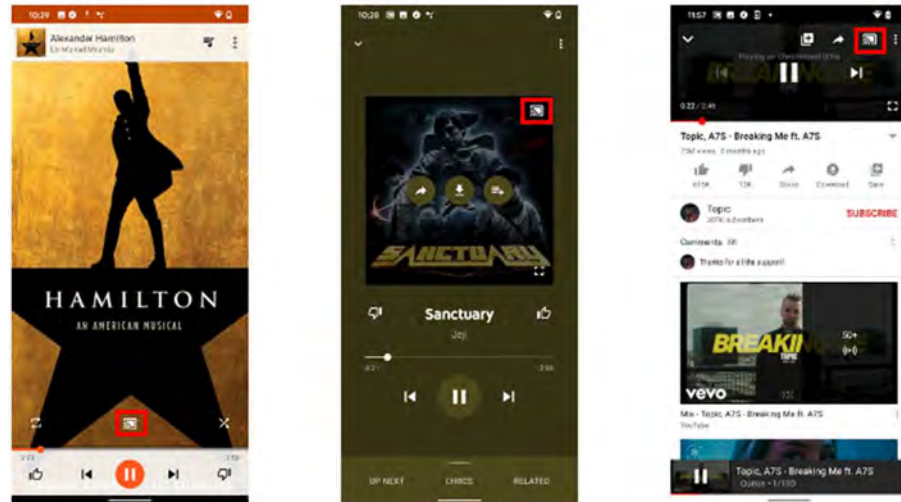
based on receiving the user input, transmitting an instruction for the at least one given playback device to take over responsibility for playback of the remote playback queue from the

Each Chromecast-enabled computing device comprises instructions that, when executed by a Chromecast-enabled computing device's processor, cause the Chromecast-enabled computing device to, based on receiving the user input, transmit an instruction for the at least one given Chromecast-enabled media player to take over responsibility for playback of the remote playback queue from the Chromecast-enabled computing device, wherein the instruction configures the at least one given Chromecast-enabled media player to (i) communicate with the Google cloud-based computing system in order to obtain data identifying a next one or more media items that are in the remote playback queue, (ii) use the obtained data to retrieve at least one

<p>computing device, wherein the instruction configures the at least one given playback device to (i) communicate with the cloud-based computing system in order to obtain data identifying a next one or more media items that are in the remote playback queue, (ii) use the obtained data to retrieve at least one media item in the remote playback queue from the cloud-based media service; and (iii) play back the retrieved at least one media item;</p>	<p>media item in the remote playback queue from the Google cloud-based media service; and (iii) play back the retrieved at least one media item.</p> <p>For instance, on information and belief, each Chromecast-enabled computing device is programmed such that, based on receiving the user input indicating a selection of at least one Chromecast-enabled media player in the Chromecast-enabled playback system that is on the same LAN as the Chromecast-enabled computing device and available to accept playback responsibility for the remote playback queue, the Chromecast-enabled computing device is configured to transmit an instruction for the Chromecast-enabled media player to take over responsibility for playback of the remote playback queue from the Chromecast-enabled computing device, where the instruction configures the Chromecast-enabled media player to (i) communicate with a Google cloud server associated with a Google cloud-based media service (e.g., Google Play Music, YouTube Music, YouTube, etc.) in order to obtain data identifying a next one or more media items that are in the remote playback queue (e.g., resource locators for such media items), (ii) use the obtained data to retrieve at least one media item in the remote playback queue from the Google cloud-based media service; and (iii) play back the retrieved at least one media item. <i>See, e.g.,</i> https://support.google.com/googlenest/answer/7181830?hl=en-GB&ref_topic=7030084; https://support.google.com/chromecast/answer/6178107?co=GENIE.Platform%3DAndroid&hl=en; https://support.google.com/chromecast/answer/2995235?hl=en-AU; https://support.google.com/googlenest/answer/9563059?hl=en-GB&ref_topic=7030084; https://support.google.com/chromecast/answer/3228332?hl=en-GB&ref_topic=4602553&co=GENIE.Platform%3DDesktop&oco=1.</p> <p>Likewise each Hub media player comprises instructions that, when executed by a Hub media player's processor, cause the Hub media player to, based on receiving the user input, transmit an instruction for the at least one given Chromecast-enabled media player to take over responsibility for playback of the remote playback queue from the Hub media player, wherein the instruction configures the at least one given Chromecast-enabled media player to (i) communicate with the Google cloud-based computing system in order to obtain data identifying a next one or more media items that are in the remote playback queue, (ii) use the obtained data to retrieve at least one media item in the remote playback queue from the Google cloud-based media service; and (iii) play back the retrieved at least one media item.</p>
--	--

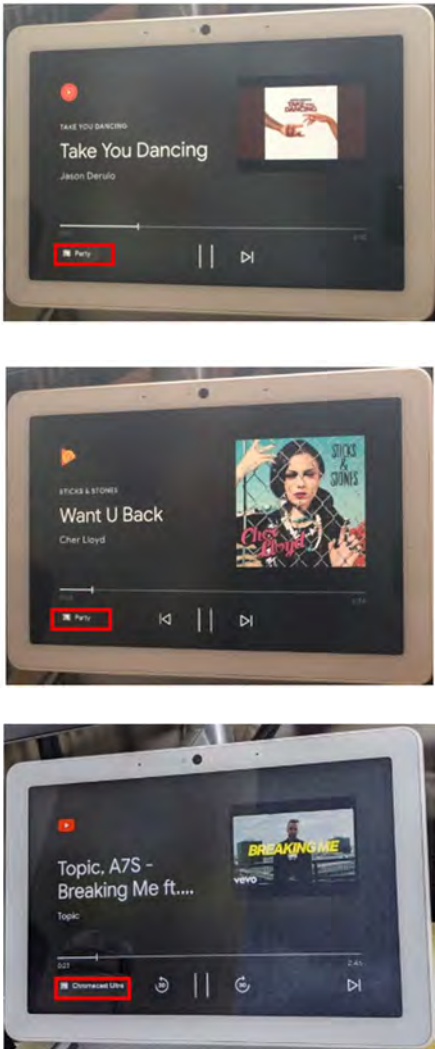
	<p>For instance, on information and belief, each Hub media player is programmed such that, based on receiving the user input indicating a selection of at least one other Chromecast-enabled media player in the Chromecast-enabled playback system that is on the same LAN as the Hub media player and available to accept playback responsibility for the remote playback queue, the Hub media player is configured to transmit an instruction for the other Chromecast-enabled media player to take over responsibility for playback of the remote playback queue from the Hub media player, where the instruction configures the other Chromecast-enabled media player to (i) communicate with a Google cloud server associated with a Google cloud-based media service (e.g., Google Play Music, YouTube Music, YouTube, etc.) in order to obtain data identifying a next one or more media items that are in the remote playback queue (e.g., resource locators for such media items), (ii) use the obtained data to retrieve at least one media item in the remote playback queue from the Google cloud-based media service; and (iii) play back the retrieved at least one media item. <i>See, e.g., id.</i></p>
<p>detecting an indication that playback responsibility for the remote playback queue has been successfully transferred from the computing device to the at least one given playback device; and</p>	<p>Each Chromecast-enabled computing device comprises instructions that, when executed by a Chromecast-enabled computing device's processor, cause the Chromecast-enabled computing device to detect an indication that playback responsibility for the remote playback queue has been successfully transferred from the Chromecast-enabled computing device to the at least one given Chromecast-enabled media player.</p> <p>For instance, each Chromecast-enabled computing device is programmed with the capability to detect an indication that playback responsibility for the remote playback queue has been successfully transferred from the Chromecast-enabled computing device to at least one Chromecast-enabled media player, which is demonstrated by the fact that the Chromecast-enabled computing device displays an indicator that playback responsibility for the remote playback queue has been successfully transferred to the at least one Chromecast-enabled media player that takes the form of a "Cast button" that is "filled in" and/or "dark grey." <i>See, e.g.,</i> https://support.google.com/googlenest/answer/7181830?hl=en-GB&ref_topic=7030084 ("When you're connected, the Cast button will turn from light to dark grey, letting you know that you're connected."); https://support.google.com/chromecast/answer/3228332?hl=en-GB&ref_topic=4602553&co=GENIE.Platform%3DDesktop&oco=1 ("To the right of the address bar, next to your extensions, you'll see Active cast .</p> <p>https://support.google.com/chromecast/answer/6178107?co=GENIE.Platform%3DAndroid&hl=en;</p>

<https://support.google.com/chromecast/answer/2995235?hl=en-AU>; https://support.google.com/chromecast/answer/3265953?hl=en-GB&ref_topic=4602553. Examples of a Chromecast-enabled computing device detecting an indication that playback responsibility for the remote playback queue has been successfully transferred from the Chromecast-enabled computing device to at least one Chromecast-enabled media player are illustrated in the following screenshots from a Chromecast-enabled computing device running at least the YouTube Music, Google Play Music, and YouTube apps:



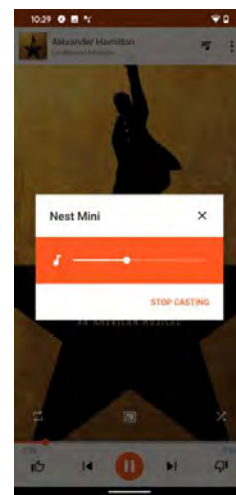
Likewise, each Hub media player comprises instructions that, when executed by a Hub media player's processor, cause the Hub media player to detect an indication that playback responsibility for the remote playback queue has been successfully transferred from the Hub media player to the at least one given Chromecast-enabled media player.

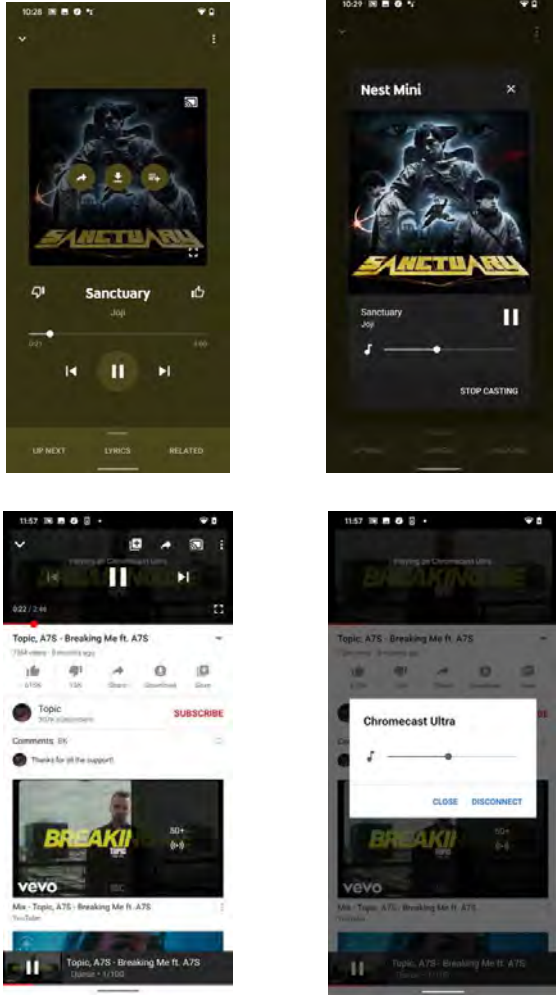
For instance, each Hub media player is programmed with the capability to detect an indication that playback responsibility for the remote playback queue has been successfully transferred from the Hub media player to at least one other Chromecast-enabled media player, which is demonstrated by the fact that the Chromecast-enabled computing device displays an indicator that playback responsibility for the remote playback queue has been successfully transferred to the at least one other Chromecast-enabled media player that takes the form of a "Cast button" that is "filled in" and/or has a "dark grey" color along with a display of the other Chromecast-enabled media player's name. *See, e.g.*, https://support.google.com/googlenest/answer/9563059?hl=en-GB&ref_topic=7030084. Examples of a selectable "Cast button" having this second visual appearance are illustrated in the following

	<p>screenshots from a Hub media player running at least the YouTube Music, Google Play Music, and YouTube apps:</p> 
<p>after detecting the indication, transitioning from i) the first mode in which the computing device is configured for playback of the remote playback queue to ii) a second mode in which the computing device is configured to control the at least one given playback device's playback of the</p>	<p>Each Chromecast-enabled computing device comprises instructions that, when executed by a Chromecast-enabled computing device's processor, cause the Chromecast-enabled computing device to, after detecting the indication, transition from (i) the first mode in which the Chromecast-enabled computing device is configured for playback of the remote playback queue to (ii) a second mode in which the Chromecast-enabled computing device is configured to control the at least one given Chromecast audio player's playback of the remote playback queue and the Chromecast-enabled computing device is no longer configured for playback of the remote playback queue.</p> <p>For instance, each Chromecast-enabled computing device is programmed such that, after detecting the indication that playback responsibility for the remote playback queue has been successfully transferred from the Chromecast-enabled computing device to at least</p>

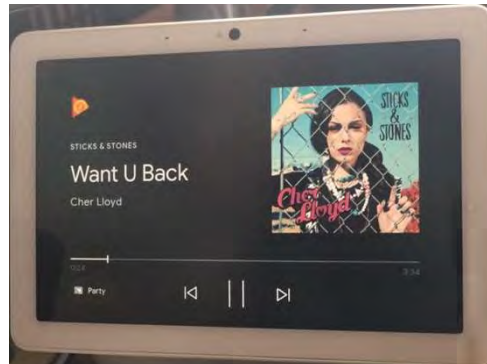
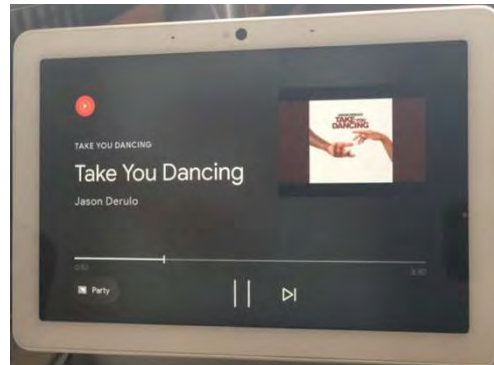
remote playback queue and the computing device is no longer configured for playback of the remote playback queue.

one Chromecast-enabled media player in the Chromecast-enabled playback system that is on the same LAN as the Chromecast-enabled computing device, the Chromecast-enabled computing device is configured to transition from (i) the first mode in which the Chromecast-enabled computing device was configured for playback of the remote playback queue to (ii) a second mode in which the Chromecast-enabled computing device is configured to control the at least one Chromecast-enabled media player's playback of the remote playback queue (while the Chromecast-enabled computing device itself is no longer configured for playback of the remote playback queue). *See, e.g.,* https://support.google.com/googlenest/answer/7181830?hl=en-GB&ref_topic=7030084; <https://support.google.com/chromecast/answer/6178107?co=GENIE.Platform%3DAndroid&hl=en>; <https://support.google.com/chromecast/answer/2995235?hl=en-AU>; https://support.google.com/chromecast/answer/3228332?hl=en-GB&ref_topic=4602553&co=GENIE.Platform%3DDesktop&oco=1; https://support.google.com/chromecast/answer/3265953?hl=en-GB&ref_topic=4602553. Examples of a Chromecast-enabled computing device in this second mode are illustrated in the following screenshots from a Chromecast-enabled computing device running at least the YouTube Music, Google Play Music, and YouTube apps:



	 <p>The four screenshots illustrate the application's functionality for managing playback between a Hub media player and Chromecast devices. The top-left screenshot shows the 'Sanctuary' song playing on the Hub. The top-right screenshot shows the 'Nest Mini' Chromecast selected for playback. The bottom-left screenshot shows the 'Breaking Me ft. A7S' video playing on the Hub. The bottom-right screenshot shows the 'Chromecast Ultra' dialog box, indicating the playback has been transferred to the Chromecast device.</p> <p>Each Hub media player comprises instructions that, when executed by a Hub media player's processor, cause the Hub media player to, after detecting the indication, transition from (i) the first mode in which the Hub media player is configured for playback of the remote playback queue to (ii) a second mode in which the Hub media player is configured to control the at least one given Chromecast audio player's playback of the remote playback queue and the Hub media player is no longer configured for playback of the remote playback queue.</p> <p>For instance, each Hub media player is programmed such that, after detecting the indication that playback responsibility for the remote playback queue has been successfully transferred from the Hub media player to at least one other Chromecast-enabled media player in the Chromecast-enabled playback system that is on the same LAN as the Hub media player, the Hub media player is configured to transition from (i) the first mode in which the Hub media player was configured for playback of the remote playback queue to (ii) a second mode in which the Hub media player is configured to control the at least one</p>
--	--

other Chromecast-enabled media player's playback of the remote playback queue (while the Hub media player itself is no longer configured for playback of the remote playback queue). *See, e.g.,* https://support.google.com/googlenest/answer/9563059?hl=en-GB&ref_topic=7030084. Examples of a Hub media player in this second mode are illustrated in the following screenshots from a Hub media player running at least the YouTube Music, Google Play Music, and YouTube apps:



95. On September 28, 2020, Sonos provided Google with a draft of this complaint prior to its filing. That draft identified the '033 Patent and described how Google's products

infringed. Thus, Google had actual knowledge of Sonos's allegation that Google infringed claims of the '033 Patent prior to Sonos filing the complaint in this action.

96. Additionally and/or alternatively, Google has indirectly infringed and continues to indirectly infringe one or more of the claims of the '033 Patent, in violation of 35 U.S.C. § 271(b), by actively inducing users of the Google Wireless Audio System to directly infringe the one or more claims of the '033 Patent. In particular, (a) Google had actual knowledge of the '033 Patent and Sonos's infringement contentions, or was willfully blind to their existence, no later than September 28, 2020 when Sonos provided Google with a copy of the complaint (*see* ¶¶ 19-29 above), (b) Google intentionally causes, urges, or encourages users of the Google Wireless Audio System to directly infringe one or more claims of the '033 Patent by promoting, advertising, and instructing customers and potential customers about the Google Wireless Audio System (including uses thereof) and encouraging such customers and potential customers to engage in activity that constitutes direct infringement (*see* Exs. 22-27; *see also* citations above in the exemplary infringement claim chart for claim 1 of the '033 Patent), (c) Google knows (or should know) that its actions will induce users of the Google Wireless Audio System to directly infringe one or more claims the '033 Patent, and (d) users of the Google Wireless Audio System directly infringe one or more claims of the '033 Patent. For instance, at a minimum, Google has supplied and continues to supply the YouTube Music, Google Play Music, and YouTube apps to customers while knowing that installation and/or use of one or more of these apps will infringe one or more claims of the '033 Patent, and that Google's customers then directly infringe one or more claims of the '033 Patent by installing and/or using one or more of these apps in accordance with Google's product literature. *See, e.g., id.*

97. Additionally and/or alternatively, Google has indirectly infringed and continues to indirectly infringe one or more of the claims of the '033 Patent, in violation of 35 U.S.C. § 271(c), by offering to sell or selling within the United States, and/or importing into the United States, components in connection with the Google Wireless Audio System that contribute to the direct infringement of the '033 Patent by users of the Google Wireless Audio System. In particular,

(a) Google had actual knowledge of the '033 Patent and Sonos's infringement contentions, or was willfully blind to their existence, no later than September 28, 2020 when Sonos provided Google with a copy of the complaint (*see* ¶¶ 19-29 above), (b) Google offers for sale, sells, and/or imports, in connection with the Google Wireless Audio System, one or more material components of the invention of the '033 Patent that are not staple articles of commerce suitable for substantial noninfringing use, (c) Google knows (or should know) that such component(s) were especially made or especially adapted for use in an infringement of the '033 Patent, and (d) users of devices that comprise such material component(s) directly infringe one or more claims of the '033 Patent. For instance, at a minimum, Google offers for sale, sells, and/or imports the YouTube Music, Google Play Music, and YouTube apps for installation on devices (*e.g.*, smartphones, tablets, and computers) that meet one or more claims of the '033 Patent. *See, e.g.*, Exs. 22-27. These apps are a material component of the devices that meet the one or more claims of the '033 Patent. Further, Google especially made and/or adapted these apps for installation and use on devices that meet the one or more claims of the '033 Patent, and these apps are not a staple article of commerce suitable for substantial noninfringing use. Google's customers then directly infringe the one or more claims of the '033 Patent by installing and/or using these apps on the customers' devices.

98. Google's infringement of the '033 Patent is also willful because Google (a) had actual knowledge of the '033 Patent and Sonos's infringement contentions no later than September 28, 2020 (*see* ¶¶ 19-29 above), (b) engaged in the aforementioned activity despite an objectively high likelihood that Google's actions constituted infringement of the '033 Patent, and (c) this objectively-defined risk was either known or so obvious that it should have been known to Google.

99. Additional allegations regarding Google's pre-suit knowledge of the '033 Patent and willful infringement will likely have evidentiary support after a reasonable opportunity for discovery.

100. Sonos is entitled to recover from Google all damages that Sonos has sustained as a result of Google's infringement of the '033 Patent, including, without limitation, a reasonable royalty and lost profits.

101. Google's infringement of the '033 Patent was and continues to be willful and deliberate, entitling Sonos to enhanced damages.

102. Google's infringement of the '033 Patent is exceptional and entitles Sonos to attorneys' fees and costs incurred in prosecuting this action under 35 U.S.C. § 285.

103. Google's infringement of the '033 Patent has caused irreparable harm (including the loss of market share) to Sonos and will continue to do so unless enjoined by this Court.

COUNT III: INFRINGEMENT OF U.S. PATENT NO. 9,344,206

104. Sonos incorporates by reference and re-alleges paragraphs 1-79 of this Complaint as if fully set forth herein.

105. Google and/or users of the Google Wireless Audio System have directly infringed (either literally or under the doctrine of equivalents) and continue to directly infringe one or more of the claims of the '206 Patent, in violation of 35 U.S.C. § 271(a), by making, using, offering for sale, and/or selling the Google Wireless Audio System within the United States and/or importing the Google Wireless Audio System into the United States without authority or license.

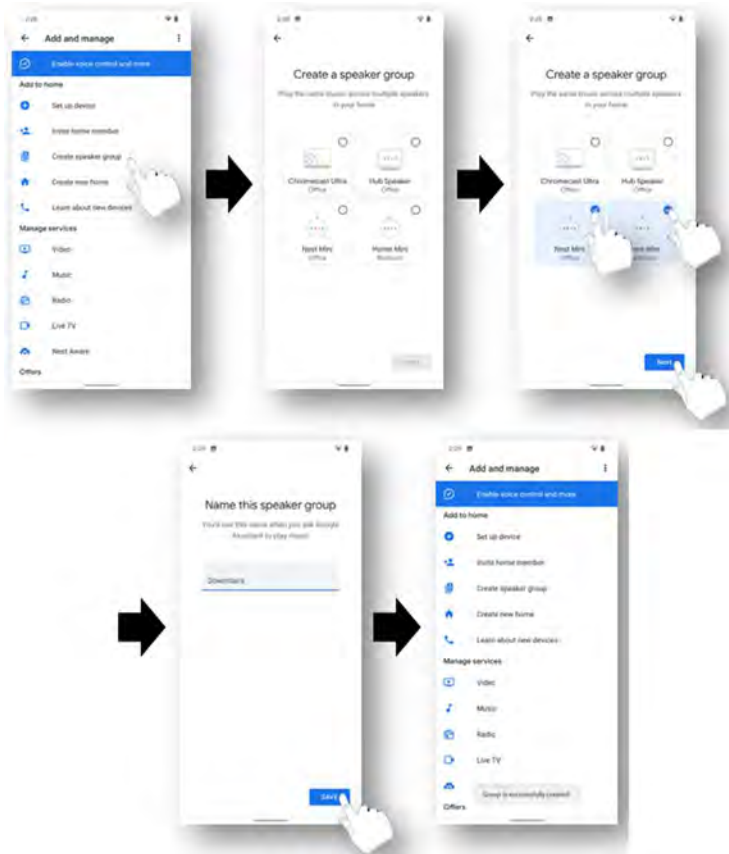
106. As just one non-limiting example, set forth below is an exemplary infringement claim chart for claim 1 of the '206 Patent in connection with the Google Wireless Audio System. This claim chart is based on publicly available information. Sonos reserves the right to modify this claim chart, including, for example, on the basis of information about the Google Wireless Audio System that it obtains during discovery.

Claim: 1	Chromecast-Enabled Computing Devices
A multimedia controller including a processor, the controller configured to:	At least each smartphone, tablet, and computer installed with at least the Google Home app (where a computing device installed with at least the Google Home app is referred to herein as a "Chromecast-enabled computing device") comprises a "multimedia controller including a processor," as recited in claim 1. At least each Home Mini, Nest Mini, Home, Home Max, Home Hub, Nest Hub, Nest Hub

	<p>Max, Nest Wifi Point, Chromecast, Chromecast Audio, Chromecast Ultra, Chromecast with Google TV, and Nest Audio (“Chromecast-enabled media player”) is a data network device configured to process and output audio that is capable of playing multimedia separately from other Chromecast-enabled media players, and thus, comprises an “independent playback device” as recited in claim 1. <i>See, e.g.,</i> https://store.google.com/us/magazine/compare_pixel; https://store.google.com/us/product/google_pixelbook_specs; https://store.google.com/us/product/pixel_slate_specs; https://store.google.com/us/product/google_home_max?hl=en-US; https://store.google.com/us/product/google_home_max_partners?hl=en-US; https://play.google.com/store/apps/details?id=com.google.android.apps.chromecast.app&hl=en_US.</p> <p>In addition to being a “independent playback device” as recited in claim 1, each Home Hub, Nest Hub, and Nest Hub Max (referred to herein as a “Hub media player”) is installed with Home/Nest Hub controller software such that the given Hub media player also comprises a “multimedia controller including a processor,” as recited in claim 1. <i>See, e.g.,</i> https://store.google.com/us/product/google_nest_hub?hl=en-US#overview-modal-music; https://store.google.com/us/product/google_nest_hub_max?hl=en-US; https://support.google.com/googlenest/answer/9165738?hl=en-GB&ref_topic=7030084</p>
<p>receive, via a network interface, a zone configuration from a first independent playback device of a plurality of independent playback devices, wherein the zone configuration is configured via the controller and maintained at the first independent playback device, and wherein the zone configuration characterizes one or more zone scenes, each zone scene</p>	<p>Each Chromecast-enabled computing device is configured to receive, via a network interface, a zone configuration from a first Chromecast-enabled media player of a plurality of Chromecast-enabled media players, where the zone configuration is configured via the Chromecast-enabled computing device, maintained at the first Chromecast-enabled media player, and characterizes one or more zone scenes that each identify a group configuration associated with two or more of the plurality of Chromecast-enabled media players.</p> <p>For instance, each Chromecast-enabled computing device on a local area network (“LAN”) is configured to facilitate creation of predefined “speaker group” comprising two or more Chromecast-enabled media players on the same LAN as the Chromecast-enabled computing device, which is “a zone scene identifying a particular group configuration.” <i>See, e.g.,</i> https://support.google.com/googlenest/answer/7174267?co=GENIE.Platform%3DAndroid&hl=en (providing instructions on how to create “speaker groups”). One example of this functionality is illustrated by the following screenshots, which shows the creation of a predefined</p>

identifying a group configuration associated with two or more of the plurality of independent playback devices; and

“Downstairs” “speaker group” that identifies a particular group configuration comprising the “Nest Mini” and “Home Mini” players:



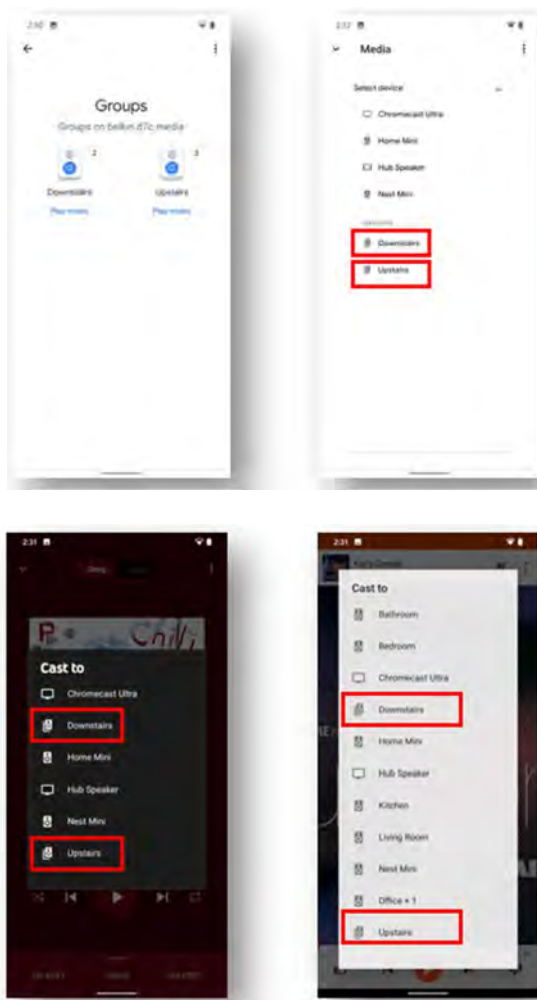
Once the predefined “speaker group” identifying the particular group configuration has been created, a zone configuration characterizing this “speaker group” is maintained at one or more of the plurality Chromecast-enabled media players on the same LAN as the Chromecast-enabled computing device (e.g., one or more of the Chromecast-enabled media players included in the predefined “speaker group”). *See, e.g., id.*

Thereafter, each Chromecast-enabled computing device and each Hub media player on the same LAN as the plurality of Chromecast-enabled media players is operable to receive the zone configuration characterizing the predefined “speaker group” from one or more of the plurality of Chromecast-enabled media players at various times – including in advance of a Chromecast-enabled computing device or Hub media player displaying the predefined “speaker group” as an available option for playback. *See, e.g.,*

<https://support.google.com/googlenest/answer/7174267?co=GENIE.Platform%3DAndroid&hl=en>;
<https://support.google.com/chromecast/answer/6178107?co=GENIE>.

Platform%3DAndroid&hl=en;
<https://support.google.com/googlenest/answer/7030379?co=GENIE.Platform%3DAndroid&hl=en-GB>;
https://support.google.com/googlenest/answer/7181830?hl=en-GB&ref_topic=7030084;
https://support.google.com/chromecast/answer/3228332?hl=en-GB&ref_topic=4602553&co=GENIE.Platform%3DDesktop&oco=1.

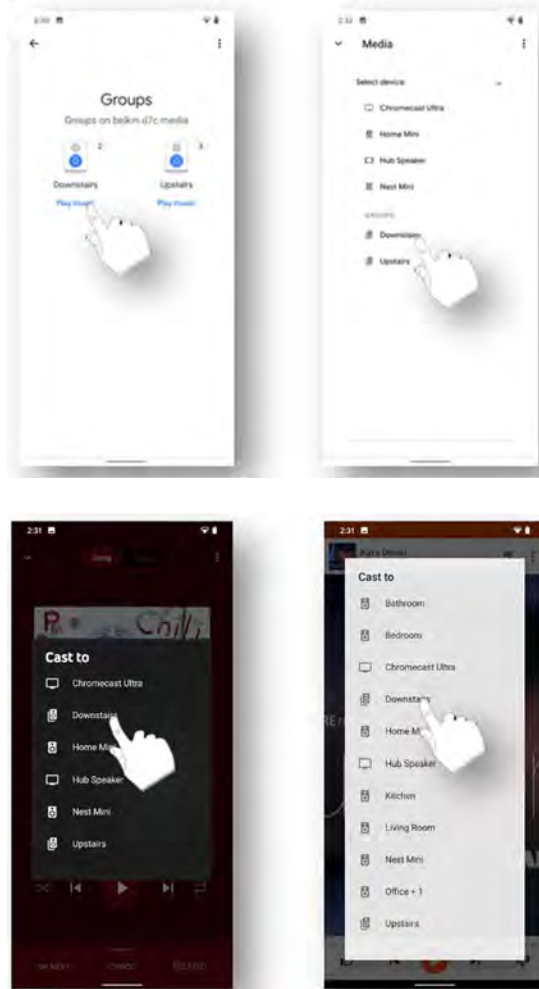
Examples of this functionality are illustrated by the following screenshots from a Chromecast-enabled computing device installed with at least the Google Home, Google Play Music and YouTube Music apps, which show a Chromecast-enabled computing device that has received a zone configuration characterizing a “Downstairs” “speaker group” and a “Upstairs” “speaker group”:



Notably, each Chromecast-enabled computing device and each Hub media player is programmed with the capability to display a predefined “speaker group” as an available option for playback regardless of whether the Chromecast-enabled computing device or

	<p>Hub media player was used to create the predefined “speaker group” (and in fact, regardless of whether the Chromecast-enabled computing device or Hub media player was even powered up or on the same LAN as the plurality of Chromecast-enabled media players at the time that the “speaker group” was created), which demonstrates that each Chromecast-enabled computing device and each Hub media player receives a zone configuration characterizing a predefined “speaker group” from one or more of the Chromecast-enabled media players selected for inclusion in the “speaker group.” <i>See e.g.</i>, https://support.google.com/googlenest/answer/7174267?co=GENIE.Platform%3DAndroid&hl=en.</p> <p>In this regard, to facilitate the above functionality, each Chromecast-enabled computing device and each Hub media player is programmed with the capability to receive, from one of the plurality of Chromecast-enabled media players, a zone configuration characterizing one or more zone scenes that each identify a respective group configuration comprising two or more of the plurality of Chromecast-enabled media players.</p>
cause a selectable indication of the received zone configuration to be displayed, wherein the displayed selectable indication is selectable to cause one or more of the zone scenes to be invoked by two or more of the plurality of independent playback devices.	<p>Each Chromecast-enabled computing device is configured to cause a selectable indication of the received zone configuration to be displayed, where the displayed selectable indication is selectable to cause one or more of the zone scenes to be invoked by two or more of the plurality of Chromecast-enabled media players.</p> <p>For instance, as noted above, each Chromecast-enabled computing device is programmed with the capability to (i) receive a zone configuration characterizing one or more zone scenes that each identify a respective group configuration comprising two or more of the plurality of Chromecast-enabled media players (e.g., one or more “speaker groups”), and (ii) cause an indication of the received zone configuration to be displayed that is selectable to cause a particular zone scene (e.g., a “speaker group”) to be invoked by two or more of the plurality of Chromecast-enabled media players. <i>See, e.g.</i>, https://support.google.com/googlenest/answer/7174267?co=GENIE.Platform%3DAndroid&hl=en; https://support.google.com/chromecast/answer/6178107?co=GENIE.Platform%3DAndroid&hl=en; https://support.google.com/googlenest/answer/7030379?co=GENIE.Platform%3DAndroid&hl=en-GB; https://support.google.com/googlenest/answer/7181830?hl=en-GB&ref_topic=7030084; https://support.google.com/chromecast/answer/3228332?hl=en-GB&ref_topic=4602553&co=GENIE.Platform%3DDesktop&oco=1. Examples of this functionality are illustrated by the following screenshots from a Chromecast-enabled computing device running at</p>

least the Google Home, Google Play Music and YouTube Music apps, which show an indication of a received zone configuration characterizing a “Downstairs” “speaker group” that is selectable to cause the “Downstairs” “speaker group” to be invoked by the Chromecast-enabled media players included in the “Downstairs” “speaker group”:



107. On September 28, 2020, Sonos provided Google with a draft of this complaint prior to its filing. That draft identified the '206 Patent and described how Google's products infringed. Thus, Google had actual knowledge of Sonos's allegation that Google infringed claims of the '206 Patent prior to Sonos filing the complaint in this action.

108. Additionally and/or alternatively, Google has indirectly infringed and continues to indirectly infringe one or more of the claims of the '206 Patent, in violation of 35 U.S.C. § 271(b),

by actively inducing users of the Google Wireless Audio System to directly infringe the one or more claims of the '206 Patent. In particular, (a) Google had actual knowledge of the '206 Patent or was willfully blind to its existence prior to, and no later than, October 2016 and had actual knowledge or was willfully blind to Sonos's infringement allegations at least as early as September 28, 2020 when Sonos provided Google a copy of the complaint (*see* ¶¶ 19-29 above), (b) Google intentionally causes, urges, or encourages users of the Google Wireless Audio System to directly infringe one or more claims of the '206 Patent by promoting, advertising, and instructing customers and potential customers about the Google Wireless Audio System (including uses thereof) and encouraging such customers and potential customers to engage in activity that constitutes direct infringement (*see* Exs. 22-23; *see also* citations above in the exemplary infringement claim chart for claim 1 of the '206 Patent), (c) Google knows (or should know) that its actions will induce users of the Google Wireless Audio System to directly infringe one or more claims the '206 Patent, and (d) users of the Google Wireless Audio System directly infringe one or more claims of the '206 Patent. For instance, at a minimum, Google has supplied and continues to supply the Google Home app to customers while knowing that installation and/or use of this app will infringe one or more claims of the '206 Patent, and that Google's customers then directly infringe one or more claims of the '206 Patent by installing and/or using this app in accordance with Google's product literature. *See, e.g., id.*

109. Additionally and/or alternatively, Google has indirectly infringed and continues to indirectly infringe one or more of the claims of the '206 Patent, in violation of 35 U.S.C. § 271(c), by offering to sell or selling within the United States, and/or importing into the United States, components in connection with the Google Wireless Audio System that contribute to the direct infringement of the '206 Patent by users of the Google Wireless Audio System. In particular, (a) Google had actual knowledge of the '206 Patent or was willfully blind to its existence prior to, and no later than, October 2016 and had actual knowledge or was willfully blind to Sonos's infringement allegations at least as early as September 28, 2020 when Sonos provided Google a copy of the complaint (*see* ¶¶ 19-29 above), (b) Google offers for sale, sells, and/or imports, in

connection with the Google Wireless Audio System, one or more material components of the invention of the '206 Patent that are not staple articles of commerce suitable for substantial noninfringing use, (c) Google knows (or should know) that such component(s) were especially made or especially adapted for use in an infringement of the '206 Patent, and (d) users of devices that comprise such material component(s) directly infringe one or more claims of the '206 Patent. For instance, at a minimum, Google offers for sale, sells, and/or imports the Google Home app for installation on devices (*e.g.*, smartphones, tablets, and computers) that meet one or more claims of the '206 Patent. *See, e.g.*, Exs. 22-23. This app is a material component of the devices that meet the one or more claims of the '206 Patent. Further, Google especially made and/or adapted this app for installation and use on devices that meet the one or more claims of the '206 Patent, and this app is not a staple article of commerce suitable for substantial noninfringing use. Google's customers then directly infringe the one or more claims of the '206 Patent by installing and/or using the Google Home app on the customers' devices.

110. Google's infringement of the '206 Patent is also willful because Google (a) had actual knowledge of the '206 Patent no later than October 2016 and actual knowledge of Sonos's infringement contentions no later than September 28, 2020 (*see* ¶¶ 19-29 above), (b) engaged in the aforementioned activity despite an objectively high likelihood that Google's actions constituted infringement of the '206 Patent, and (c) this objectively-defined risk was either known or so obvious that it should have been known to Google.

111. Additional allegations regarding Google's pre-suit knowledge of the '206 Patent and willful infringement will likely have evidentiary support after a reasonable opportunity for discovery.

112. Sonos is in compliance with any applicable marking and/or notice provisions of 35 U.S.C. § 287 with respect to the '206 Patent.

113. Sonos is entitled to recover from Google all damages that Sonos has sustained as a result of Google's infringement of the '206 Patent, including, without limitation, a reasonable royalty and lost profits.

114. Google's infringement of the '206 Patent was and continues to be willful and deliberate, entitling Sonos to enhanced damages.

115. Google's infringement of the '206 Patent is exceptional and entitles Sonos to attorneys' fees and costs incurred in prosecuting this action under 35 U.S.C. § 285.

116. Google's infringement of the '206 Patent has caused irreparable harm (including the loss of market share) to Sonos and will continue to do so unless enjoined by this Court.

COUNT IV: INFRINGEMENT OF U.S. PATENT NO. 10,469,966

117. Sonos incorporates by reference and re-alleges paragraphs 1-79 of this Complaint as if fully set forth herein.

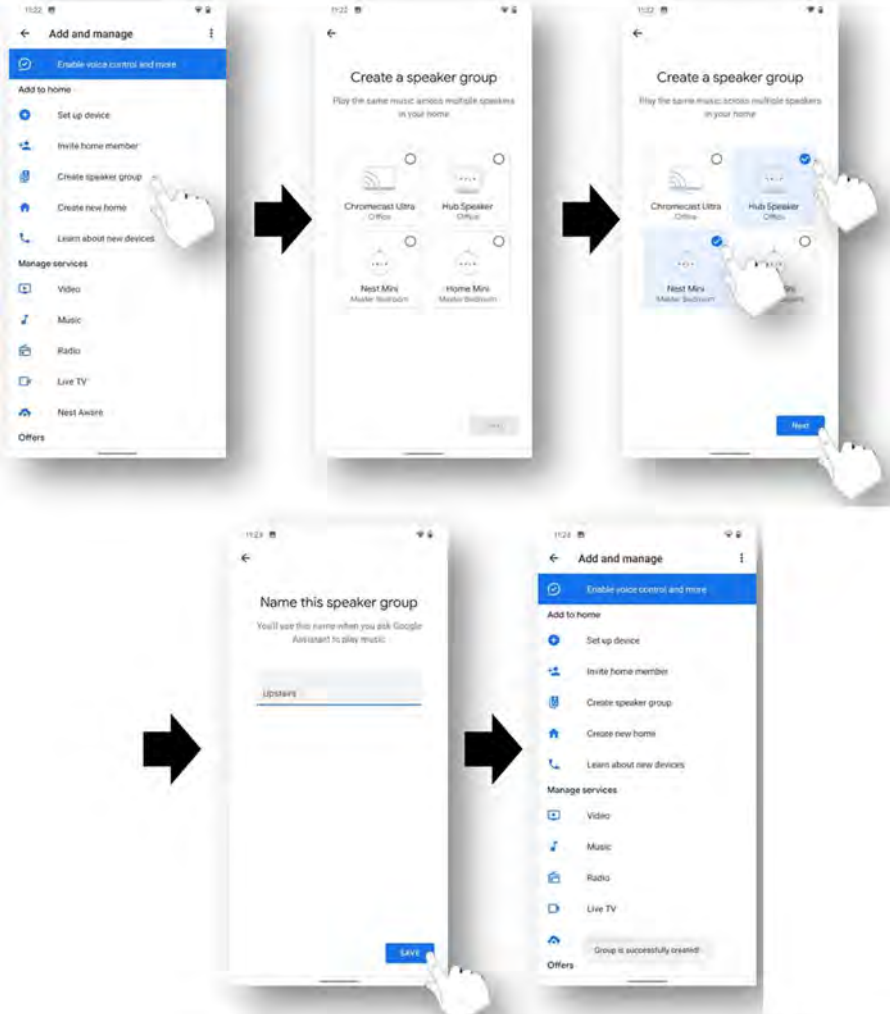
118. Google and/or users of the Google Wireless Audio System have directly infringed (either literally or under the doctrine of equivalents) and continue to directly infringe one or more of the claims of the '966 Patent, in violation of 35 U.S.C. § 271(a), by making, using, offering for sale, and/or selling the Google Wireless Audio System within the United States and/or importing the Google Wireless Audio System into the United States without authority or license.

119. As just one non-limiting example, set forth below is an exemplary infringement claim chart for claim 1 of the '966 Patent in connection with the Google Wireless Audio System. This claim chart is based on publicly available information. Sonos reserves the right to modify this claim chart, including, for example, on the basis of information about the Google Wireless Audio System that it obtains during discovery.

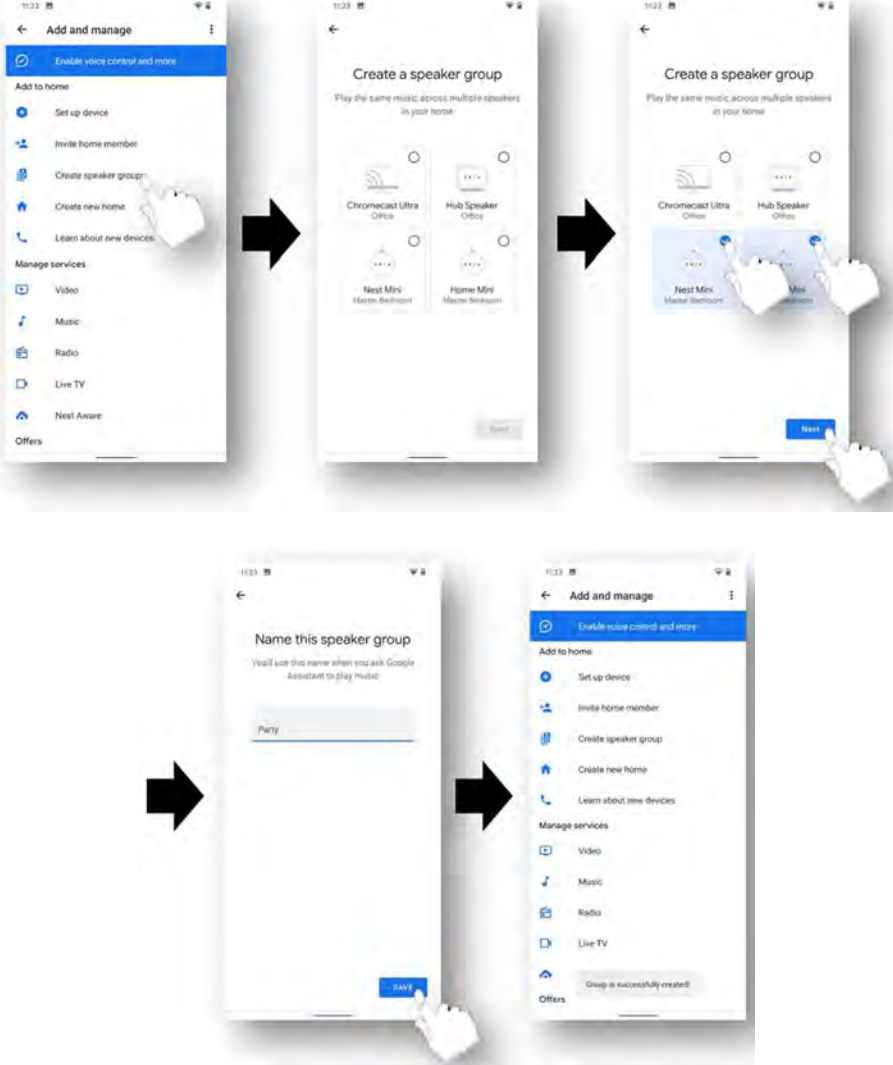
Claim: 1	Chromecast-Enabled Computing Devices
A computing device comprising:	At least each smartphone, tablet, and computer installed with at least the Google Home app (where a computing device installed with at least the Google Home app is referred to herein as a "Chromecast-enabled computing device") comprises a "computing device," as recited in claim 1. At least each Home Mini, Nest Mini, Home, Home Max, Home Hub, Nest Hub, Nest Hub Max, Nest Wifi Point, Chromecast, Chromecast Audio, Chromecast Ultra, Chromecast with Google TV, and Nest Audio ("Chromecast-enabled media player") is a data network device configured to process and output audio, and thus, comprises a "zone player" as recited in claim 1. <i>See, e.g.,</i> https://store.google.com/us/magazine/compare_pixel ;

	https://store.google.com/us/product/google_pixelbook_specs ; https://store.google.com/us/product/pixel_slate_specs ; https://store.google.com/us/product/google_home_max?hl=en-US ; https://store.google.com/us/product/google_home_max_partners?hl=en-US ; https://play.google.com/store/apps/details?id=com.google.android.apps.chromecast.app&hl=en_US .
one or more processors;	Each Chromecast-enabled computing device includes one or more processors. <i>See, e.g.,</i> https://store.google.com/us/magazine/compare_pixel ; https://store.google.com/us/product/google_pixelbook_specs ; https://store.google.com/us/product/pixel_slate_specs .
a non-transitory computer-readable medium; and	Each Chromecast-enabled computing device includes a non-transitory computer-readable medium. <i>See, e.g.,</i> https://store.google.com/us/magazine/compare_pixel ; https://store.google.com/us/product/google_pixelbook_specs ; https://store.google.com/us/product/pixel_slate_specs .
program instructions stored on the non-transitory computer-readable medium that, when executed by the one or more processors, cause the computing device to perform functions comprising:	Each Chromecast-enabled computing device includes program instructions stored on the non-transitory computer-readable medium that enable the Chromecast-enabled computing device to perform the functions identified below. <i>See, e.g.,</i> https://store.google.com/us/magazine/compare_pixel ; https://store.google.com/us/product/google_pixelbook_specs ; https://store.google.com/us/product/pixel_slate_specs .
while serving as a controller for a networked media playback system comprising a first zone player and at least two other zone players, wherein the first zone player is operating in a standalone mode in which the first zone player is configured to play back media individually:	<p>Each Chromecast-enabled computing device comprises program instructions that, when executed by a Chromecast-enabled computing device's one or more processors, cause that Chromecast-enabled computing device to, while serving as a Chromecast-enabled computing device for a Chromecast-enabled playback system comprising a first Chromecast-enabled media player and at least two other Chromecast-enabled media players, where the first Chromecast-enabled media player is operating in a standalone mode in which the first Chromecast-enabled media player is configured to play back media individually, perform the functions identified below.</p> <p>For instance, each Chromecast-enabled computing device is programmed with the capability to serve as a controller for a Chromecast-enabled playback system that includes a first Chromecast-enabled media player and at least two other Chromecast-enabled media players, where at least the first Chromecast-enabled</p>

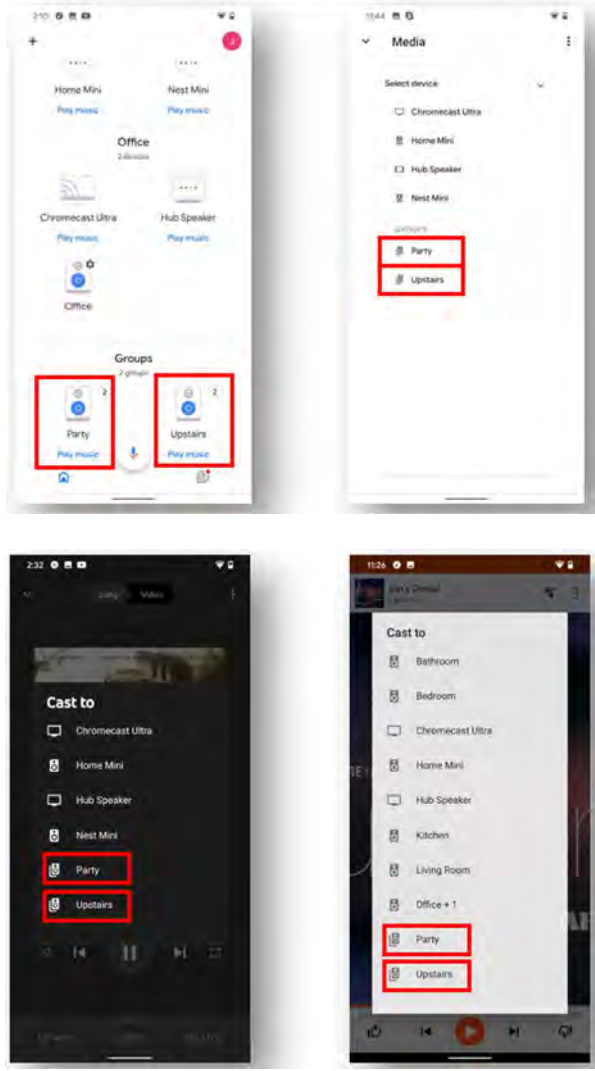
	<p>media player is operating in a standalone mode (<i>i.e.</i>, the first Chromecast-enabled media player is not operating part of an established “cast session” with a “speaker group”). <i>See, e.g.</i>, https://support.google.com/googlenest/answer/7174267?co=GENIE.Platform%3DAndroid&hl=en; https://support.google.com/chromecast/answer/6178107?co=GENIE.Platform%3DAndroid&hl=en; https://support.google.com/googlenest/answer/7030379?co=GENIE.Platform%3DAndroid&hl=en-GB; https://support.google.com/googlenest/answer/7181830?hl=en-GB&ref_topic=7030084; https://support.google.com/chromecast/answer/3228332?hl=en-GB&ref_topic=4602553&co=GENIE.Platform%3DDesktop&oco=1.</p>
<p>receiving a first request to create a first zone scene comprising a first predefined grouping of zone players including at least the first zone player and a second zone player that are to be configured for synchronous playback of media when the first zone scene is invoked;</p>	<p>Each Chromecast-enabled computing device comprises program instructions that, when executed by a Chromecast-enabled computing device’s one or more processors, cause that Chromecast-enabled computing device to receive a first request to create a first zone scene comprising a first predefined grouping of Chromecast-enabled media players including at least the first Chromecast-enabled media player and a second Chromecast-enabled media player that are to be configured for synchronous playback of media when the first zone scene is invoked.</p> <p>For instance, each Chromecast-enabled computing device is programmed such that, while serving as a controller for a Chromecast-enabled playback system that includes a first Chromecast-enabled media player and at least two other Chromecast-enabled media players, the Chromecast-enabled computing device is operable to receive a request to create a first predefined “speaker group” that includes the first Chromecast-enabled media player and a second Chromecast-enabled media player in the Chromecast-enabled playback system that are to be configured for synchronous playback of media when the first “speaker group” is launched, which is a “a first zone scene comprising a first predefined grouping of zone players including at least the first zone player and a second zone player that are to be configured for synchronous playback of media when the first zone scene is invoked.” <i>See, e.g.</i>, https://support.google.com/googlenest/answer/7174267?co=GENIE.Platform%3DAndroid&hl=en (providing instructions on how to create “speaker groups” for “synchronous music throughout the home”). One example of this functionality is illustrated by the following screenshots, which shows the creation of an “Upstairs” “speaker group” that includes the “Nest Mini” and “Hub Speaker” players:</p>

	
<p>based on the first request, i) causing creation of the first zone scene, ii) causing an indication of the first zone scene to be transmitted to the first zone player, and iii) causing storage of the first zone scene;</p>	<p>Each Chromecast-enabled computing device comprises program instructions that, when executed by a Chromecast-enabled computing device's one or more processors, cause that Chromecast-enabled computing device to, based on the first request, (i) cause creation of the first zone scene, (ii) cause an indication of the first zone scene to be transmitted to the first Chromecast-enabled media player, and (iii) cause storage of the first zone scene.</p> <p>For instance, each Chromecast-enabled computing device is programmed such that, while serving as a controller for a Chromecast-enabled playback system that includes a first Chromecast-enabled media player and at least two other Chromecast-enabled media players, the Chromecast-enabled computing device is operable to receive a request to create a first predefined "speaker group" including the first Chromecast-enabled media player and a second Chromecast-enabled media player in the Chromecast-enabled playback system (which is the claimed "first zone scene") and then based on the request, (i) cause creation of the first "speaker group,"</p>

	<p>(ii) cause an indication of the first “speaker group” to be transmitted to the first Chromecast-enabled media player, and (iii) cause storage of the first “speaker group” at one or more Chromecast-enabled media players. <i>See e.g.</i>, https://support.google.com/googlenest/answer/7174267?co=GENIE.Platform%3DAndroid&hl=en (providing instructions on how to create “speaker groups”).</p>
<p>receiving a second request to create a second zone scene comprising a second predefined grouping of zone players including at least the first zone player and a third zone player that are to be configured for synchronous playback of media when the second zone scene is invoked, wherein the third zone player is different than the second zone player;</p>	<p>Each Chromecast-enabled computing device comprises program instructions that, when executed by a Chromecast-enabled computing device’s one or more processors, cause that Chromecast-enabled computing device to receive a second request to create a second zone scene comprising a second predefined grouping of Chromecast-enabled media players including at least the first Chromecast-enabled media player and a third Chromecast-enabled media player that are to be configured for synchronous playback of media when the second zone scene is invoked, where the third Chromecast-enabled media player is different than the second Chromecast-enabled media player.</p> <p>For instance, each Chromecast-enabled computing device is programmed such that, while serving as a controller for a Chromecast-enabled playback system that includes a first Chromecast-enabled media player and at least two other Chromecast-enabled media players, the Chromecast-enabled computing device is configured to receive a request to create a first predefined “speaker group” that includes the first Chromecast-enabled media player and a third Chromecast-enabled media player that are to be configured for synchronous playback of media when the second “speaker group” is launched, which is a “a second zone scene comprising a second predefined grouping of zone players including at least the first zone player and a third zone player that are to be configured for synchronous playback of media when the second zone scene is invoked.” <i>See, e.g.</i>, https://support.google.com/googlenest/answer/7174267?co=GENIE.Platform%3DAndroid&hl=en (providing instructions on how to create “speaker groups” for “synchronous music throughout the home”). One example of this functionality is illustrated by the following screenshots, which shows the creation of a “Party” “speaker group” that includes the “Nest Mini” and “Home Mini” players:</p>

	
<p>based on the second request, i) causing creation of the second zone scene, ii) causing an indication of the second zone scene to be transmitted to the first zone player, and iii) causing storage of the second zone scene;</p>	<p>Each Chromecast-enabled computing device comprises program instructions that, when executed by a Chromecast-enabled computing device's one or more processors, cause that Chromecast-enabled computing device to, based on the second request, (i) cause creation of the second zone scene, (ii) cause an indication of the second zone scene to be transmitted to the first Chromecast-enabled media player, and (iii) cause storage of the second zone scene.</p> <p>For instance, each Chromecast-enabled computing device is programmed such that, while serving as a controller for a Chromecast-enabled playback system that includes a first Chromecast-enabled media player and at least two other Chromecast-enabled media players, the Chromecast-enabled computing device is operable to receive a request to create a second predefined "speaker group" including the first Chromecast-enabled media player and a third Chromecast-enabled media player in the Chromecast-enabled playback system (which is the claimed "second zone scene") and then</p>

	<p>based on the request, (i) cause creation of the second “speaker group,” (ii) cause an indication of the second “speaker group” to be transmitted to the first Chromecast-enabled media player, and (iii) cause storage of the second “speaker group” at one or more Chromecast-enabled media players. <i>See e.g.</i>, https://support.google.com/googlenest/answer/7174267?co=GENIE.Platform%3DAndroid&hl=en (providing instructions on how to create “speaker groups”).</p>
displaying a representation of the first zone scene and a representation of the second zone scene; and	<p>Each Chromecast-enabled computing device comprises program instructions that, when executed by a Chromecast-enabled computing device’s one or more processors, cause that Chromecast-enabled computing device to display a representation of the first zone scene and a representation of the second zone scene.</p> <p>For instance, each Chromecast-enabled computing device is programmed such that, while serving as a controller for a Chromecast-enabled playback system that includes a first Chromecast-enabled media player and at least two other Chromecast-enabled media players that are each, the Chromecast-enabled computing device is operable to display (i) a representation of a first predefined “speaker group” including the first Chromecast-enabled media player and a second Chromecast-enabled media player (which is the claimed “first zone scene”), and (ii) a representation of a second predefined “speaker group” including the first Chromecast-enabled media player and a third Chromecast-enabled media player (which is the claimed second zone scene”). <i>See, e.g.</i>, https://support.google.com/googlenest/answer/7174267?co=GENIE.Platform%3DAndroid&hl=en; https://support.google.com/chromecast/answer/6178107?co=GENIE.Platform%3DAndroid&hl=en; https://support.google.com/googlenest/answer/7030379?co=GENIE.Platform%3DAndroid&hl=en-GB; https://support.google.com/googlenest/answer/7181830?hl=en-GB&ref_topic=7030084; https://support.google.com/chromecast/answer/3228332?hl=en-GB&ref_topic=4602553&co=GENIE.Platform%3DDesktop&oco=1. Examples of this functionality are illustrated by the following screenshots from a Chromecast-enabled computing device installed with at least the Google Home, Google Play Music, and YouTube Music apps, which show a displayed representation of the “Upstairs” “speaker group” that includes the “Nest Mini” and “Hub Speaker” players, and a displayed representation of the “Party” “speaker group” that includes the “Nest Mini” and “Home Mini” players:</p>

	
<p>while displaying the representation of the first zone scene and the representation of the second zone scene, receiving a third request to invoke the first zone scene; and</p>	<p>Each Chromecast-enabled computing device comprises program instructions that, when executed by a Chromecast-enabled computing device's one or more processors, cause that Chromecast-enabled computing device to, while displaying the representation of the first zone scene and the representation of the second zone scene, receive a third request to invoke the first zone scene.</p> <p>For instance, each Chromecast-enabled computing device is programmed such that, while displaying (i) a representation of a first predefined "speaker group" including the first Chromecast-enabled media player and a second Chromecast-enabled media player (which is the claimed "first zone scene"), and (ii) a representation of a second predefined "speaker group" including the first Chromecast-enabled media player and a third Chromecast-enabled media player (which is the claimed second zone scene"), the Chromecast-enabled computing device is operable to receive a request to launch the first</p>

“speaker group,” which is a “request to invoke the first zone scene.”
See, e.g.,

<https://support.google.com/googlenest/answer/7174267?co=GENIE.Platform%3DAndroid&hl=en>;

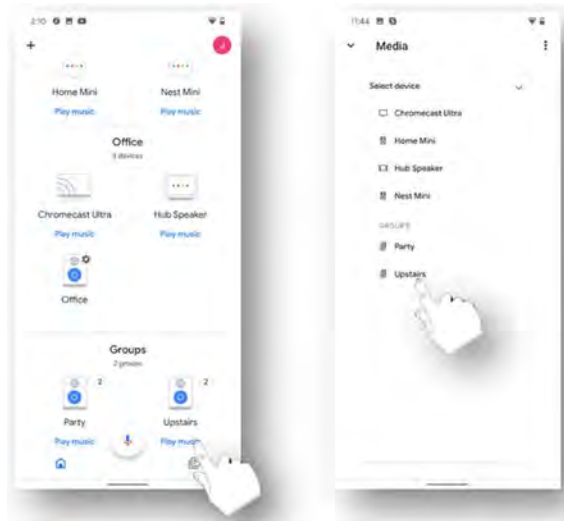
<https://support.google.com/chromecast/answer/6178107?co=GENIE.Platform%3DAndroid&hl=en>;

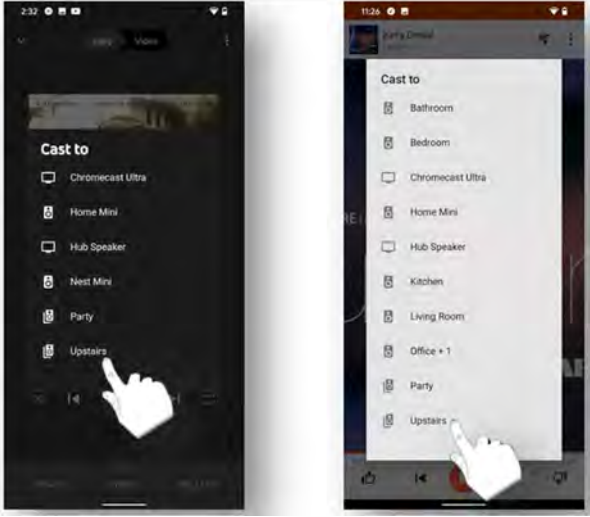
<https://support.google.com/googlenest/answer/7030379?co=GENIE.Platform%3DAndroid&hl=en-GB>;

https://support.google.com/googlenest/answer/7181830?hl=en-GB&ref_topic=7030084;

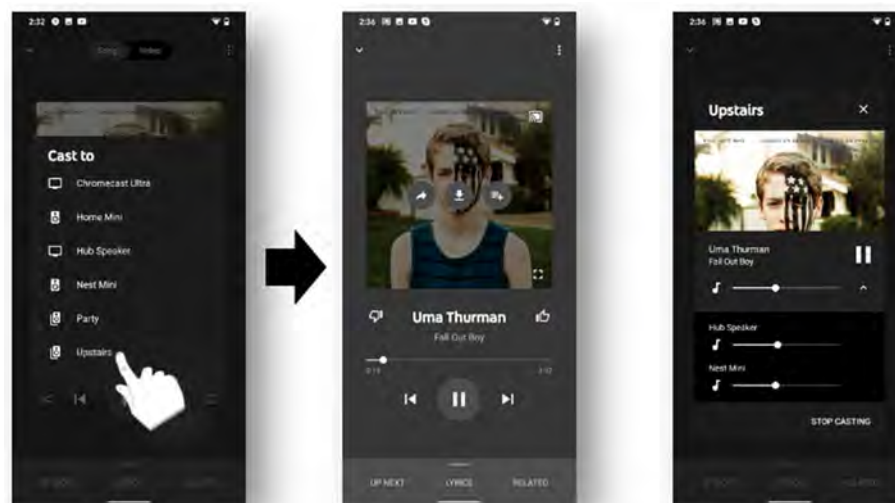
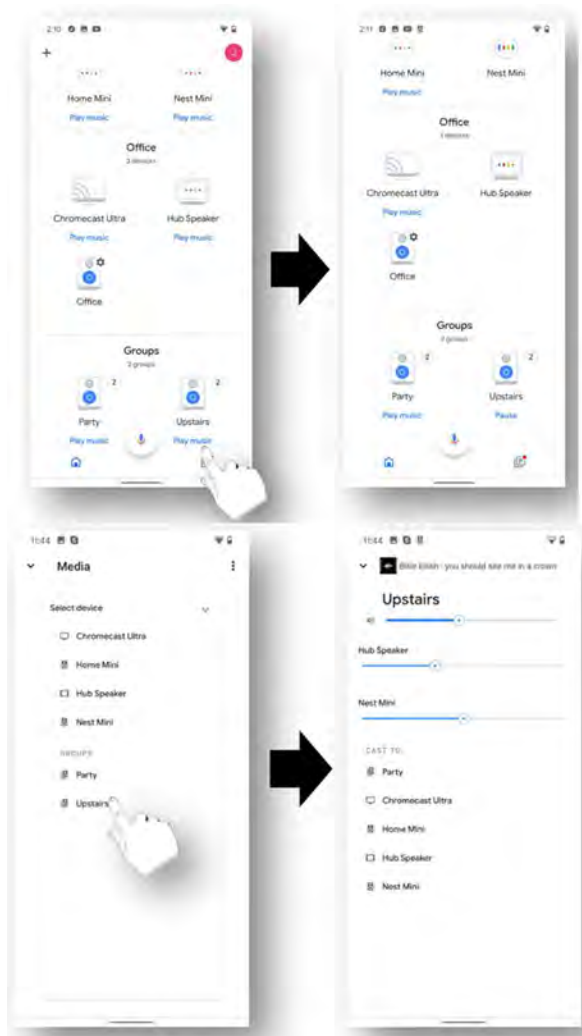
https://support.google.com/chromecast/answer/3228332?hl=en-GB&ref_topic=4602553&co=GENIE.Platform%3DDesktop&oco=1.

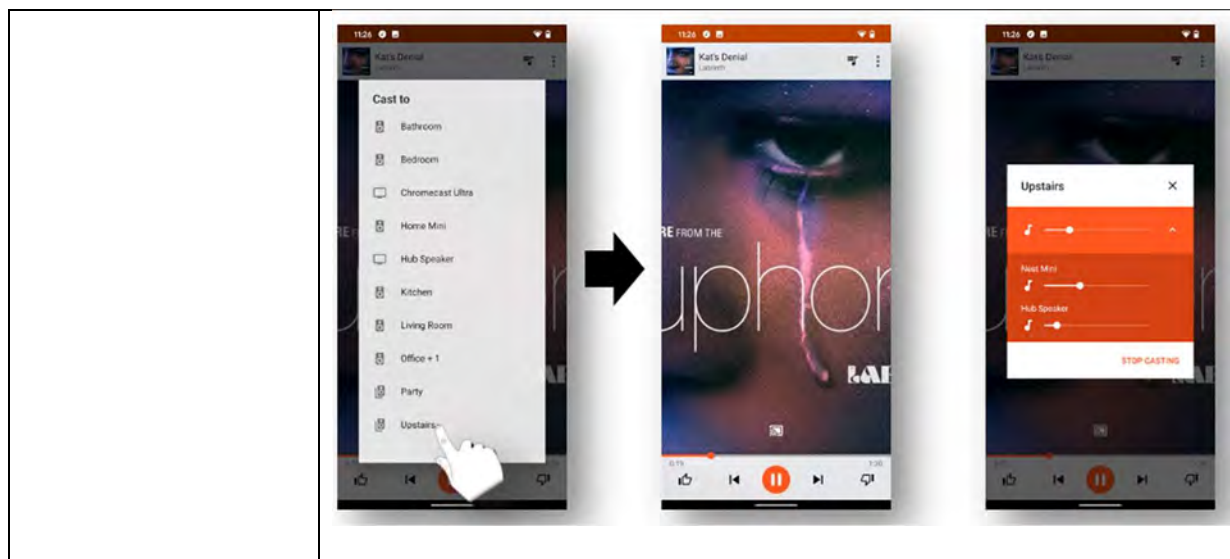
Examples of this functionality are illustrated by the following screenshots from a Chromecast-enabled computing device installed with at least the Google Home, Google Play Music, and YouTube Music apps, which show receipt of a request to launch the “Upstairs” “speaker pair”:



	
<p>based on the third request, causing the first zone player to transition from operating in the standalone mode to operating in accordance with the first predefined grouping of zone players such that the first zone player is configured to coordinate with at least the second zone player to output media in synchrony with output of media by at least the second zone player.</p>	<p>Each Chromecast-enabled computing device comprises program instructions that, when executed by a Chromecast-enabled computing device's one or more processors, cause that Chromecast-enabled computing device to, based on the third request, cause the first Chromecast-enabled media player to transition from operating in the standalone mode to operating in accordance with the first predefined grouping of Chromecast-enabled media players such that the first Chromecast-enabled media player is configured to coordinate with at least the second Chromecast-enabled media player to output media in synchrony with output of media by at least the second Chromecast-enabled media player.</p> <p>For instance, each Chromecast-enabled computing device is programmed such that, based on a request to launch a first "speaker group" (which is the claimed "third request to invoke the first zone scene"), the Chromecast-enabled computing device is operable to cause the first Chromecast-enabled media player to transition from operating in a standalone mode to operating in accordance with the first "speaker group" such that the first Chromecast-enabled media player is configured to coordinate with at least the second Chromecast-enabled media player to output audio in synchrony with the output of audio by the second Chromecast-enabled media player.</p> <p><i>See, e.g.,</i> https://support.google.com/googlenest/answer/7174267?co=GENIE.Platform%3DAndroid&hl=en ("Group any combination of Google Nest or Google Home speakers and displays and Chromecast devices together for synchronous music throughout the home."). Examples of this functionality are illustrated by the following screenshots from a Chromecast-enabled computing device installed with at least the Google Home, Google Play Music, and YouTube Music apps, which show the "Upstairs" "speaker group" being launched such that the</p>

“Nest Mini” and “Hub Speaker” players are configured to coordinate with one another to play audio in synchrony:





120. On September 28, 2020, Sonos provided Google with a draft of this complaint prior to its filing. That draft identified the '966 Patent and described how Google's products infringed. Thus, Google had actual knowledge of Sonos's allegation that Google infringed claims of the '966 Patent prior to Sonos filing the complaint in this action.

121. Additionally and/or alternatively, Google has indirectly infringed and continues to indirectly infringe one or more of the claims of the '966 Patent, in violation of 35 U.S.C. § 271(b), by actively inducing users of the Google Wireless Audio System to directly infringe the one or more claims of the '966 Patent. In particular, (a) Google had actual knowledge of the '966 Patent and Sonos's infringement contentions, or was willfully blind to their existence, no later than September 28, 2020 when Sonos provided Google with a copy of the complaint (*see* ¶¶ 19-29 above), (b) Google intentionally causes, urges, or encourages users of the Google Wireless Audio System to directly infringe one or more claims of the '966 Patent by promoting, advertising, and instructing customers and potential customers about the Google Wireless Audio System (including uses thereof) and encouraging such customers and potential customers to engage in activity that constitutes direct infringement (*see* Exs. 22-23; *see also* citations above in the exemplary infringement claim chart for claim 1 of the '966 Patent), (c) Google knows (or should know) that its actions will induce users of the Google Wireless Audio System to directly infringe

one or more claims the '966 Patent, and (d) users of the Google Wireless Audio System directly infringe one or more claims of the '966 Patent. For instance, at a minimum, Google has supplied and continues to supply the Google Home app to customers while knowing that installation and/or use of this app will infringe one or more claims of the '966 Patent, and that Google's customers then directly infringe one or more claims of the '966 Patent by installing and/or using this app in accordance with Google's product literature. *See, e.g., id.*

122. Additionally and/or alternatively, Google has indirectly infringed and continues to indirectly infringe one or more of the claims of the '966 Patent, in violation of 35 U.S.C. § 271(c), by offering to sell or selling within the United States, and/or importing into the United States, components in connection with the Google Wireless Audio System that contribute to the direct infringement of the '966 Patent by users of the Google Wireless Audio System. In particular, (a) Google had actual knowledge of the '966 Patent and Sonos's infringement contentions, or was willfully blind to their existence, no later than September 28, 2020 when Sonos provided Google with a copy of the complaint (*see* ¶¶ 19-29 above), (b) Google offers for sale, sells, and/or imports, in connection with the Google Wireless Audio System, one or more material components of the invention of the '966 Patent that are not staple articles of commerce suitable for substantial noninfringing use, (c) Google knows (or should know) that such component(s) were especially made or especially adapted for use in an infringement of the '966 Patent, and (d) users of devices that comprise such material component(s) directly infringe one or more claims of the '966 Patent. For instance, at a minimum, Google offers for sale, sells, and/or imports the Google Home app for installation on devices (*e.g.*, smartphones, tablets, and computers) that meet one or more claims of the '966 Patent. *See, e.g.*, Exs. 22-23. This app is a material component of the devices that meet the one or more claims of the '966 Patent. Further, Google especially made and/or adapted this app for installation and use on devices that meet the one or more claims of the '966 Patent, and this app is not a staple article of commerce suitable for substantial noninfringing use. Google's customers then directly infringe the one or more claims of the '966 Patent by installing and/or using the Google Home app on the customers' devices.

123. Google's infringement of the '966 Patent is also willful because Google (a) had actual knowledge of the '966 Patent and actual knowledge of Sonos's infringement contentions no later than September 28, 2020 (*see* ¶¶ 19-29 above), (b) engaged in the aforementioned activity despite an objectively high likelihood that Google's actions constituted infringement of the '966 Patent, and (c) this objectively-defined risk was either known or so obvious that it should have been known to Google.

124. Additional allegations regarding Google's pre-suit knowledge of the '966 Patent and willful infringement will likely have evidentiary support after a reasonable opportunity for discovery.

125. Sonos is in compliance with any applicable marking and/or notice provisions of 35 U.S.C. § 287 with respect to the '966 Patent.

126. Sonos is entitled to recover from Google all damages that Sonos has sustained as a result of Google's infringement of the '966 Patent, including, without limitation, a reasonable royalty and lost profits.

127. Google's infringement of the '966 Patent was and continues to be willful and deliberate, entitling Sonos to enhanced damages.

128. Google's infringement of the '966 Patent is exceptional and entitles Sonos to attorneys' fees and costs incurred in prosecuting this action under 35 U.S.C. § 285.

129. Google's infringement of the '966 Patent has caused irreparable harm (including the loss of market share) to Sonos and will continue to do so unless enjoined by this Court.

COUNT V: INFRINGEMENT OF U.S. PATENT NO. 9,219,460

130. Sonos incorporates by reference and re-alleges paragraphs 1-79 of this Complaint as if fully set forth herein.

131. Google and/or users of the Google Wireless Audio System have directly infringed (either literally or under the doctrine of equivalents) and continue to directly infringe one or more of the claims of the '460 Patent, in violation of 35 U.S.C. § 271(a), by making, using, offering for

sale, and/or selling the Google Wireless Audio System within the United States and/or importing the Google Wireless Audio System into the United States without authority or license.

132. As just one non-limiting example, set forth below is an exemplary infringement claim chart for claim 15 of the '460 Patent in connection with the Google Wireless Audio System. This claim chart is based on publicly available information. Sonos reserves the right to modify this claim chart, including, for example, on the basis of information about the Google Wireless Audio System that it obtains during discovery.

Claim: 15	Chromecast-Enabled Media Players
A playback device, comprising:	At least each Google Home Max and Nest Audio player (referred to herein as a "Chromecast-enabled media player") comprises a "playback device," as recited in claim 15.
a speaker;	Each of the foregoing Chromecast-enabled media players includes a speaker. <i>See, e.g.,</i> https://support.google.com/googlenest/answer/7072284?hl=en ; https://store.google.com/us/product/google_home_max_specs_speaker?hl=en-US .
a microphone that is physically coupled to the speaker;	Each of the foregoing Chromecast-enabled media players includes a microphone that is physically coupled to the speaker. <i>See, e.g.,</i> https://support.google.com/googlenest/answer/7072284?hl=en ; https://store.google.com/us/product/google_home_max_specs_speaker?hl=en-US .
a processor;	Each of the foregoing Chromecast-enabled media players includes a processor. <i>See, e.g.,</i> https://support.google.com/googlenest/answer/7072284?hl=en ; https://store.google.com/us/product/google_home_max_specs_speaker?hl=en-US .
a network interface;	Each of the foregoing Chromecast-enabled media players includes a network interface, such as a WiFi interface. <i>See, e.g.,</i> https://support.google.com/googlenest/answer/7072284?hl=en ; https://store.google.com/us/product/google_home_max_specs_speaker?hl=en-US .
a data storage; and a program logic stored in the data storage and executable by the processor to:	Each of the foregoing Chromecast-enabled media players includes a data storage and executable program logic stored in the data storage that enable each Chromecast-enabled media player to perform the functions identified below. <i>See, e.g.,</i> https://support.google.com/googlenest/answer/7072284?hl=en ; https://store.google.com/us/product/google_home_max_specs_speaker?hl=en-US .

<p>emit a first audio signal from the speaker;</p>	<p>Each of the foregoing Chromecast-enabled media players comprises program logic that, when executed by the Chromecast-enabled media player's processor, causes that Chromecast-enabled media player to emit a first audio signal from the speaker.</p> <p>For instance, each of the foregoing Chromecast-enabled media players is programmed with the capability to emit a first audio signal from one of its speakers to facilitate measuring the acoustics of a space surrounding the Chromecast-enabled media player. <i>See, e.g.,</i> https://support.google.com/googlenest/answer/7585574?hl=en ("Once you set up Max, Room EQ measures the acoustics of your space."); https://www.youtube.com/watch?v=UiBhshQ0FQA ("With Smart Sound, Google Home Max uses machine learning to automatically adjust the equalizer settings to match the acoustics of your room.").</p>
<p>detect, via the microphone, a second audio signal, wherein at least a portion of the second audio signal is a reflection of the first audio signal;</p>	<p>Each of the foregoing Chromecast-enabled media players comprises program logic that, when executed by the Chromecast-enabled media player's processor, causes that Chromecast-enabled media player to detect, via its microphone, a second audio signal, wherein at least a portion of the second audio signal is a reflection of the first audio signal.</p> <p>For instance, each of the foregoing Chromecast-enabled media players is programmed with the capability to detect, via its microphone, a second audio signal, where at least a portion of the second audio signal is a reflection of the first audio signal that was emitted to facilitate measuring the acoustics of a space surrounding the Chromecast-enabled media player. <i>See, e.g.,</i> https://support.google.com/googlenest/answer/7585574?hl=en ("Once you set up Max, Room EQ measures the acoustics of your space. . . . Note: The microphone must be on for Room EQ to work."); https://www.youtube.com/watch?v=UiBhshQ0FQA (disclosing that the Google Home Max "uses six internal microphones to measure the acoustics of your room.").</p>
<p>in response to the detecting, determine a first reflection characteristic based on at least the second audio signal;</p>	<p>Each of the foregoing Chromecast-enabled media players comprises program logic that, when executed by the Chromecast-enabled media player's processor, causes that Chromecast-enabled media player to, in response to the detecting, determine a first reflection characteristic based on at least the second audio signal.</p> <p>For instance, each of the foregoing Chromecast-enabled media players is programmed such that, in response to detecting a second audio signal comprising a reflection of a first audio signal that was emitted to facilitate measuring the acoustics of a space surrounding the Chromecast-enabled media player, the Chromecast-enabled media player is configured to determine one or more reflection characteristics based on at least the detected second audio signal. <i>See,</i></p>

	<p>e.g., https://support.google.com/googlenest/answer/7585574?hl=en (“Walls in a room can amplify the bass, leading to a muddled sound in which the bass overpowers the vocals of your music. Room EQ automatically corrects for this excess bass. This leads to a more balanced sound.”); https://www.youtube.com/watch?v=UiBhshQ0FQA.</p>
adjust an equalization setting of the playback device based on at least the first reflection characteristic; and	<p>Each of the foregoing Chromecast-enabled media players comprises program logic that, when executed by the Chromecast-enabled media player’s processor, causes that Chromecast-enabled media player to adjust the equalization setting of the Chromecast-enabled media player based on at least the first reflection characteristic.</p> <p>For instance, each of the foregoing Chromecast-enabled media players is programmed with the capability to adjust its equalization setting (e.g., a “bass” setting) based on one or more reflection characteristics. <i>See, e.g.,</i> https://support.google.com/googlenest/answer/7585574?hl=en (“Room EQ automatically corrects for this excess bass. This leads to a more balanced sound.”); https://www.youtube.com/watch?v=UiBhshQ0FQA (“With Smart Sound, Google Home Max uses machine learning to automatically adjust the equalizer settings to match the acoustics of your room.”).</p>
play, via the speaker, an audio track according to the equalization setting.	<p>Each of the foregoing Chromecast-enabled media players comprises program logic that, when executed by the Chromecast-enabled media player’s processor, causes that Chromecast-enabled media player to play, via its speaker, an audio track according to the equalization setting.</p> <p>For instance, each of the foregoing Chromecast-enabled media players is programmed with the capability to play, via one of its speakers, audio according to the equalization setting (e.g., “bass” setting) that was adjusted as described above. <i>See, e.g.,</i> https://support.google.com/googlenest/answer/7585574?hl=en (“Room EQ automatically corrects for this excess bass. This leads to a more balanced sound.”); https://www.youtube.com/watch?v=UiBhshQ0FQA (“With Smart Sound, Google Home Max uses machine learning to automatically adjust the equalizer settings to match the acoustics of your room.”).</p>

133. On September 28, 2020, Sonos provided Google with a draft of this complaint prior to its filing. That draft identified the ’460 Patent and described how Google’s products infringed. Thus, Google had actual knowledge of Sonos’s allegation that Google infringed claims of the ’460 Patent prior to Sonos filing the complaint in this action.

134. Additionally and/or alternatively, Google has indirectly infringed and continues to indirectly infringe one or more of the claims of the '460 Patent, in violation of 35 U.S.C. § 271(b), by actively inducing users of the Google Wireless Audio System to directly infringe the one or more claims of the '460 Patent. In particular, (a) Google had actual knowledge of the '460 Patent or was willfully blind to its existence prior to, and no later than, January 2018 and had actual knowledge or was willfully blind to Sonos's infringement allegations at least as early as September 28, 2020 when Sonos provided Google a copy of the complaint (*see* ¶¶ 19-29 above), (b) Google intentionally causes, urges, or encourages users of the Google Wireless Audio System to directly infringe one or more claims of the '460 Patent by promoting, advertising, and instructing customers and potential customers about the Google Wireless Audio System (including uses thereof) and encouraging such customers and potential customers to engage in activity that constitutes direct infringement (*see* citations above in the exemplary infringement claim chart for claim 15 of the '460 Patent; *see also* Ex. 42), (c) Google knows (or should know) that its actions will induce users of the Google Wireless Audio System to directly infringe one or more claims of the '460 Patent, and (d) users of the Google Wireless Audio System directly infringe one or more claims of the '460 Patent. For instance, at a minimum, Google has supplied and continues to supply the Google Home Max and Nest Audio to customers while knowing that use of these products will infringe one or more claims of the '460 Patent and that Google's customers then directly infringe one or more claims of the '460 Patent by using the Google Home Max and Nest Audio in accordance with Google's product literature. *See, e.g., id.*

135. Additionally and/or alternatively, Google has indirectly infringed and continues to indirectly infringe one or more of the claims of the '460 Patent, in violation of 35 U.S.C. § 271(c), by offering to sell or selling within the United States, and/or importing into the United States, components in connection with the Google Wireless Audio System that contribute to the direct infringement of the '460 Patent by users of the Google Wireless Audio System. In particular, (a) Google had actual knowledge of the '460 Patent or was willfully blind to its existence prior to, and no later than, January 2018 and had actual knowledge or was willfully blind to Sonos's

infringement allegations at least as early as September 28, 2020 when Sonos provided Google a copy of the complaint (*see* ¶¶ 19-29 above), (b) Google offers for sale, sells, and/or imports, in connection with the Google Wireless Audio System, one or more material components of the invention of the '460 Patent that are not staple articles of commerce suitable for substantial noninfringing use, (c) Google knows (or should know) that such component(s) were especially made or especially adapted for use in an infringement of the '460 Patent, and (d) users of devices that comprise such material component(s) directly infringe one or more claims of the '460 Patent. For instance, at a minimum, Google offers for sale, sells, and/or imports software updates for the Google Home Max and Nest Audio that meet one or more claims of the '460 Patent. *See, e.g.,* Ex. 43. These software updates are material components of the Google Home Max and Nest Audio that meet the one or more claims of the '460 Patent. Further, Google especially made and/or adapted these software updates for installation and use on the Google Home Max and Nest Audio that meet the one or more claims of the '460 Patent, and these software updates are not staple articles of commerce suitable for substantial noninfringing use. Google's customers then directly infringe the one or more claims of the '460 Patent by installing and using software updates on the Google Home Max and Nest Audio.

136. Google's infringement of the '460 Patent is also willful because Google (a) had actual knowledge of the '460 Patent no later than January 2018 and actual notice of Sonos's infringement contentions no later than September 28, 2020 (*see* ¶¶ 19-29 above), (b) engaged in the aforementioned activity despite an objectively high likelihood that Google's actions constituted infringement of the '460 Patent, and (c) this objectively-defined risk was either known or so obvious that it should have been known to Google.

137. Additional allegations regarding Google's pre-suit knowledge of the '460 Patent and willful infringement will likely have evidentiary support after a reasonable opportunity for discovery.

138. Sonos is entitled to recover from Google all damages that Sonos has sustained as a result of Google's infringement of the '460 Patent, including, without limitation, a reasonable royalty and lost profits.

139. Google's infringement of the '460 Patent was and continues to be willful and deliberate, entitling Sonos to enhanced damages.

140. Google's infringement of the '460 Patent is exceptional and entitles Sonos to attorneys' fees and costs incurred in prosecuting this action under 35 U.S.C. § 285. Google's infringement of the '460 Patent has caused irreparable harm (including the loss of market share) to Sonos and will continue to do so unless enjoined by this Court.

PRAYER FOR RELIEF

WHEREFORE, Sonos respectfully requests:

- A. That Judgment be entered that Google has infringed at least one or more claims of the patents-in-suit, directly and/or indirectly, literally and/or under the doctrine of equivalents, and that such infringement is willful;
- B. An injunction enjoining Google, its officers, agents, servants, employees and attorneys, and other persons in active concert or participation with Google, and its parents, subsidiaries, divisions, successors and assigns, from further infringement of the patents-in-suit.
- C. An award of damages sufficient to compensate Sonos for Google's infringement under 35 U.S.C. § 284, including an enhancement of damages on account of Google's willful infringement;
- D. That the case be found exceptional under 35 U.S.C. § 285 and that Sonos be awarded its reasonable attorneys' fees;
- E. Costs and expenses in this action;
- F. An award of prejudgment and post-judgment interest; and

G. Such other and further relief as the Court may deem just and proper.

DEMAND FOR JURY TRIAL

Pursuant to Rule 38(b) of the Federal Rules of Civil Procedure, Sonos respectfully demands a trial by jury on all issues triable by jury.

Dated: September 29, 2020

Respectfully submitted,

By: /s/

Attorneys for Plaintiff Sonos, Inc.

EXHIBIT 1

(12) **United States Patent**
Coburn, IV et al.

(10) **Patent No.:** **US 9,967,615 B2**
(45) **Date of Patent:** ***May 8, 2018**

(54) **NETWORKED MUSIC PLAYBACK**

(56) **References Cited**

(71) Applicant: **Sonos, Inc.**, Santa Barbara, CA (US)

U.S. PATENT DOCUMENTS

(72) Inventors: **Arthur Coburn, IV**, Cambridge, MA (US); **Joni Hoadley**, Santa Barbara, CA (US)

5,406,634 A 4/1995 Anderson et al.
5,440,644 A 8/1995 Farinelli et al.
(Continued)

(73) Assignee: **Sonos, Inc.**, Santa Barbara, CA (US)

FOREIGN PATENT DOCUMENTS

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

CA 2832542 A1 10/2012
CN 101212823 A 7/2008
(Continued)

This patent is subject to a terminal disclaimer.

OTHER PUBLICATIONS

(21) Appl. No.: **14/628,952**

International Bureau, "International Preliminary Report on Patentability", issued in connection with PCT application No. PCT/US2012/071212, dated Jul. 10, 2014, pp. 8.

(22) Filed: **Feb. 23, 2015**

(Continued)

(65) **Prior Publication Data**

US 2015/0172756 A1 Jun. 18, 2015

Primary Examiner — Oschat Montoya

(74) *Attorney, Agent, or Firm* — McDonnell Boehnen Hulbert & Berghoff LLP

Related U.S. Application Data

(63) Continuation of application No. 13/341,237, filed on Dec. 30, 2011, now Pat. No. 9,654,821.

(51) **Int. Cl.**

H04N 7/18 (2006.01)
H04N 21/436 (2011.01)

(Continued)

(52) **U.S. Cl.**

CPC ... **H04N 21/43615** (2013.01); **H04L 65/4084** (2013.01); **H04N 21/4307** (2013.01);
(Continued)

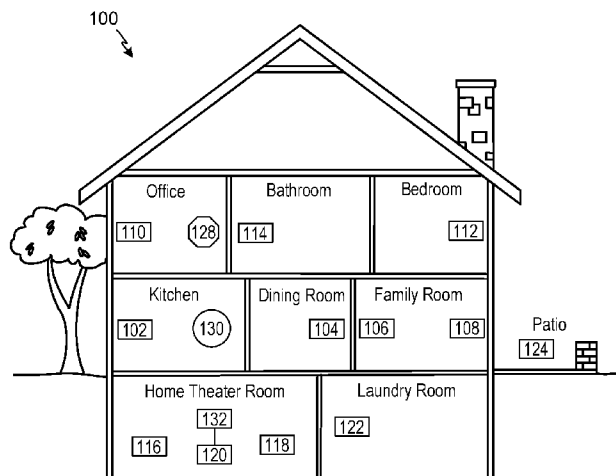
(58) **Field of Classification Search**

CPC H04N 21/43615; H04N 21/6581; H04N 21/439; H04N 21/6125; H04N 21/64322;
(Continued)

ABSTRACT

Systems, methods, apparatus, and articles of manufacture to facilitate connection to a multimedia playback network are disclosed. An example method includes detecting a first input including an identification of a playback device; detecting a second input including an identification of an item on a controller, wherein multimedia content associated with the item is retrievable from a content provider; detecting a trigger, wherein the trigger is not the first input or the second input; and sending, in response to detecting the trigger, information regarding the multimedia content from the controller to the playback device, wherein the information includes an identification of the multimedia content for playback by the playback device, and wherein the information causes (a) the playback device to retrieve, independent of the controller, the multimedia content from the content provider and (b) playback of the retrieved multimedia content.

29 Claims, 11 Drawing Sheets



US 9,967,615 B2

Page 2

- (51) **Int. Cl.**
- | | | | | |
|---------------------|-----------|-------------------|---------|---------------------------------------|
| <i>H04N 21/658</i> | (2011.01) | 7,725,551 B2 | 5/2010 | Szeto et al. |
| <i>H04L 29/06</i> | (2006.01) | 7,742,740 B2 | 6/2010 | Goldberg et al. |
| <i>H04N 21/439</i> | (2011.01) | 7,797,446 B2 | 9/2010 | Heller et al. |
| <i>H04N 21/61</i> | (2011.01) | 7,805,682 B1 | 9/2010 | Lambourne |
| <i>H04N 21/643</i> | (2011.01) | 7,827,259 B2 | 11/2010 | Heller et al. |
| <i>H04N 21/6587</i> | (2011.01) | 7,853,341 B2 | 12/2010 | McCarty et al. |
| <i>H04N 21/472</i> | (2011.01) | 7,958,441 B2 | 6/2011 | Heller et al. |
| <i>H04N 21/485</i> | (2011.01) | 7,987,294 B2 | 7/2011 | Bryce et al. |
| <i>H04N 21/81</i> | (2011.01) | 8,014,423 B2 | 9/2011 | Thaler et al. |
| <i>H04N 21/43</i> | (2011.01) | 8,045,952 B2 | 10/2011 | Qureshey et al. |
| <i>H04N 21/433</i> | (2011.01) | 8,050,652 B2 | 11/2011 | Qureshey et al. |
| <i>H04N 21/858</i> | (2011.01) | 8,055,364 B2 | 11/2011 | Champion |
| | | 8,060,407 B1 | 11/2011 | Delker et al. |
| | | 8,072,905 B2 | 12/2011 | Haff et al. |
| | | 8,074,253 B1 | 12/2011 | Nathan |
| | | 8,099,313 B2 | 1/2012 | Messer et al. |
| | | 8,103,009 B2 | 1/2012 | McCarty et al. |
| | | 8,111,132 B2 | 2/2012 | Allen et al. |
| | | 8,131,390 B2 | 3/2012 | Braithwaite et al. |
| | | 8,140,974 B2 | 3/2012 | Hayter et al. |
| | | 8,148,622 B2 | 4/2012 | Rothkopf et al. |
| | | 8,156,435 B2 | 4/2012 | Wohlert |
| | | 8,204,890 B1 | 6/2012 | Gogan |
| | | 8,214,740 B2 | 7/2012 | Johnson |
| | | 8,234,395 B2 | 7/2012 | Millington |
| | | 8,290,603 B1 | 10/2012 | Lambourne |
| | | 8,316,154 B2 | 11/2012 | Yoneda |
| | | 8,364,296 B2 * | 1/2013 | Wilhelm G11B 27/10
455/502 |
| | | 8,407,623 B2 | 3/2013 | Kerr et al. |
| | | 8,483,853 B1 | 7/2013 | Lambourne |
| | | 8,544,046 B2 | 9/2013 | Gran et al. |
| | | 8,588,949 B2 | 11/2013 | Lambourne et al. |
| | | 8,799,395 B2 | 8/2014 | Seidel et al. |
| | | 8,818,538 B2 | 8/2014 | Sakata |
| | | 8,843,586 B2 | 9/2014 | Pantos et al. |
| | | 8,880,648 B1 | 11/2014 | Arora et al. |
| | | 8,942,252 B2 | 1/2015 | Balassanian et al. |
| | | 8,954,177 B2 | 2/2015 | Sanders |
| | | 8,966,394 B2 | 2/2015 | Gates et al. |
| | | 9,137,602 B2 | 9/2015 | Mayman et al. |
| | | 9,338,206 B2 | 5/2016 | Keum et al. |
| | | 9,507,780 B2 | 11/2016 | Rothkopf et al. |
| | | 9,609,448 B2 | 3/2017 | Bentley et al. |
| | | 9,635,068 B2 | 4/2017 | Garmark et al. |
| | | 2001/0042107 A1 | 11/2001 | Palm |
| | | 2002/0002039 A1 | 1/2002 | Qureshey et al. |
| | | 2002/0022453 A1 | 2/2002 | Balog et al. |
| | | 2002/0026442 A1 | 2/2002 | Lipscomb et al. |
| | | 2002/0124097 A1 | 9/2002 | Isely et al. |
| | | 2002/0165921 A1 | 11/2002 | Sapieyevski |
| | | 2002/0178191 A1 | 11/2002 | Sielken |
| | | 2002/0194309 A1 | 12/2002 | Carter et al. |
| | | 2003/0023741 A1 | 1/2003 | Tomassetti et al. |
| | | 2003/0079038 A1 | 4/2003 | Robbin et al. |
| | | 2003/0157951 A1 | 8/2003 | Hasty |
| | | 2003/0198257 A1 * | 10/2003 | Sullivan et al. 370/516 |
| | | 2003/0210796 A1 | 11/2003 | McCarty et al. |
| | | 2004/0024478 A1 | 2/2004 | Hans et al. |
| | | 2004/0025185 A1 | 2/2004 | Goci et al. |
| | | 2004/0078383 A1 | 4/2004 | Mercer et al. |
| | | 2004/0078812 A1 | 4/2004 | Calvert |
| | | 2004/0215611 A1 | 10/2004 | Jawa et al. |
| | | 2004/0261040 A1 | 12/2004 | Radcliffe et al. |
| | | 2005/0028225 A1 | 2/2005 | Dawson et al. |
| | | 2005/0108320 A1 | 5/2005 | Lord et al. |
| | | 2005/0138193 A1 | 6/2005 | Encarnacion et al. |
| | | 2005/0155072 A1 | 7/2005 | Kaczowka et al. |
| | | 2005/0166157 A1 | 7/2005 | Ollis et al. |
| | | 2005/0235334 A1 * | 10/2005 | Togashi H04L 12/2807
725/117 |
| | | 2005/0240494 A1 | 10/2005 | Cue et al. |
| | | 2005/0262253 A1 | 11/2005 | Li et al. |
| | | 2006/0002681 A1 | 1/2006 | Spilo et al. |
| | | 2006/0041639 A1 | 2/2006 | Lamkin et al. |
| | | 2006/0062094 A1 | 3/2006 | Nathan et al. |
| | | 2006/0107237 A1 | 5/2006 | Kim |
| | | 2006/0156236 A1 | 7/2006 | Heller et al. |
| | | 2006/0168340 A1 | 7/2006 | Heller et al. |
- (52) **U.S. Cl.**
- CPC *H04N 21/439* (2013.01); *H04N 21/4333* (2013.01); *H04N 21/47202* (2013.01); *H04N 21/4852* (2013.01); *H04N 21/6125* (2013.01); *H04N 21/64322* (2013.01); *H04N 21/6581* (2013.01); *H04N 21/6587* (2013.01); *H04N 21/8113* (2013.01); *H04N 21/8586* (2013.01)
- (58) **Field of Classification Search**
- CPC *H04N 21/6587*; *H04N 21/47202*; *H04N 21/4852*; *H04N 21/8113*; *H04N 21/4307*; *H04N 21/4333*; *H04N 21/8586*; *H04L 65/4084*
- See application file for complete search history.
- (56) **References Cited**
- U.S. PATENT DOCUMENTS
- | | | |
|--------------|---------|--------------------|
| 5,761,320 A | 6/1998 | Farinelli et al. |
| 5,856,827 A | 1/1999 | Sudo |
| 5,923,902 A | 7/1999 | Inagaki |
| 6,002,862 A | 12/1999 | Takaiki |
| 6,032,202 A | 2/2000 | Lea et al. |
| 6,181,316 B1 | 1/2001 | Little et al. |
| 6,255,961 B1 | 7/2001 | Van et al. |
| 6,256,554 B1 | 7/2001 | Dilorenzo |
| 6,404,811 B1 | 6/2002 | Cvetko et al. |
| 6,469,633 B1 | 10/2002 | Wachter |
| 6,522,886 B1 | 2/2003 | Youngs et al. |
| 6,587,127 B1 | 7/2003 | Leeke et al. |
| 6,611,537 B1 | 8/2003 | Edens et al. |
| 6,631,410 B1 | 10/2003 | Kowalski et al. |
| 6,728,531 B1 | 4/2004 | Lee et al. |
| 6,732,155 B2 | 5/2004 | Meek |
| 6,757,517 B2 | 6/2004 | Chang |
| 6,778,869 B2 | 8/2004 | Champion |
| 6,826,283 B1 | 11/2004 | Wheeler et al. |
| 6,985,694 B1 | 1/2006 | De et al. |
| 7,017,118 B1 | 3/2006 | Carroll |
| 7,020,048 B2 | 3/2006 | McComas |
| 7,113,833 B1 | 9/2006 | Brown et al. |
| 7,117,451 B2 | 10/2006 | Sielken |
| 7,130,608 B2 | 10/2006 | Hollstrom et al. |
| 7,130,616 B2 | 10/2006 | Janik |
| 7,143,939 B2 | 12/2006 | Henzerling |
| 7,178,106 B2 | 2/2007 | Lamkin et al. |
| 7,187,947 B1 | 3/2007 | White et al. |
| 7,236,773 B2 | 6/2007 | Thomas |
| 7,295,548 B2 | 11/2007 | Blank et al. |
| 7,312,785 B2 | 12/2007 | Tsuk et al. |
| 7,358,960 B2 | 4/2008 | Mak |
| 7,391,791 B2 | 6/2008 | Balassanian et al. |
| 7,483,538 B2 | 1/2009 | McCarty et al. |
| 7,509,181 B2 | 3/2009 | Champion |
| 7,571,014 B1 | 8/2009 | Lambourne et al. |
| 7,630,501 B2 | 12/2009 | Blank et al. |
| 7,643,894 B2 | 1/2010 | Braithwaite et al. |
| 7,657,910 B1 | 2/2010 | McAulay et al. |
| 7,689,304 B2 | 3/2010 | Sasaki |
| 7,725,533 B2 | 5/2010 | Szeto et al. |

US 9,967,615 B2

Page 3

(56)

References Cited

U.S. PATENT DOCUMENTS

2006/0195480 A1	8/2006	Spiegelman et al.	2011/0295974 A1	12/2011	Kashef et al.
2006/0195521 A1	8/2006	New et al.	2012/0029672 A1	2/2012	Hamilton et al.
2006/0195864 A1	8/2006	New et al.	2012/0038541 A1	2/2012	Song et al.
2006/0218294 A1	9/2006	Rosenberg	2012/0040720 A1	2/2012	Zhang et al.
2006/0253782 A1	11/2006	Stark et al.	2012/0050012 A1	3/2012	Alsina et al.
2006/0258289 A1 *	11/2006	Dua G06F 17/30058 455/41.3	2012/0054808 A1	3/2012	Nijim
2006/0263048 A1	11/2006	Sato et al.	2012/0057853 A1	3/2012	Huber et al.
2007/0038999 A1	2/2007	Millington et al.	2012/0089910 A1	4/2012	Cassidy
2007/0061725 A1	3/2007	Isaac et al.	2012/0113964 A1	5/2012	Petersen et al.
2007/0067808 A1	3/2007	Dacosta	2012/0117026 A1	5/2012	Cassidy
2007/0083897 A1	4/2007	Brownell	2012/0117193 A1	5/2012	Phillips et al.
2007/0106672 A1	5/2007	Sighart et al.	2012/0117586 A1 *	5/2012	McCoy et al. 725/25
2007/0142944 A1	6/2007	Goldberg et al.	2012/0147825 A1	6/2012	Hassan et al.
2007/0169087 A1	7/2007	Fadell	2012/0159372 A1	6/2012	Stallings et al.
2007/0266065 A1	11/2007	Rosenberg	2012/0174204 A1	7/2012	Sturm et al.
2007/0288470 A1	12/2007	Kauniskangas et al.	2012/0185770 A1	7/2012	Hwang et al.
2008/0005690 A1	1/2008	Van	2012/0192071 A1 *	7/2012	Millington H04J 3/0664 715/716
2008/0016465 A1	1/2008	Foxenland	2012/0202485 A1	8/2012	Mirbaha et al.
2008/0018625 A1	1/2008	Ijichi et al.	2012/0227076 A1	9/2012	McCoy et al.
2008/0025535 A1	1/2008	Rajapakse	2012/0233067 A1	9/2012	Matthew et al.
2008/0059567 A1	3/2008	Williams et al.	2012/0272062 A1	10/2012	Lee et al.
2008/0086379 A1	4/2008	Dion et al.	2012/0284423 A1	11/2012	Weel
2008/0133715 A1	6/2008	Yoneda et al.	2012/0304233 A1 *	11/2012	Roberts H04N 21/23113 725/82
2008/0134256 A1 *	6/2008	DaCosta H04N 7/17318 725/62	2012/0311094 A1	12/2012	Biderman et al.
2008/0177822 A1	7/2008	Yoneda	2012/0311618 A1	12/2012	Blaxland
2008/0209487 A1	8/2008	Osann et al.	2013/0014015 A1	1/2013	Lambourne et al.
2008/0242222 A1	10/2008	Bryce et al.	2013/0024018 A1	1/2013	Chang et al.
2008/0292120 A1	11/2008	Wilson	2013/0028263 A1	1/2013	Rajapakse
2009/0006542 A1	1/2009	Feldman et al.	2013/0047084 A1	2/2013	Sanders et al.
2009/0059512 A1	3/2009	Lydon et al.	2013/0054742 A1	2/2013	Tsuji et al.
2009/0097818 A1	4/2009	Hirata	2013/0073584 A1	3/2013	Kuper et al.
2009/0132712 A1	5/2009	P et al.	2013/0086003 A1	4/2013	Alsina et al.
2009/0171487 A1	7/2009	Wilhelm	2013/0111529 A1	5/2013	Yao et al.
2009/0172542 A1	7/2009	Girish et al.	2013/0117299 A1	5/2013	Kraatz
2009/0197524 A1	8/2009	Haff et al.	2013/0151728 A1	6/2013	Currier
2009/0222392 A1	9/2009	Martin et al.	2013/0157566 A1	6/2013	Oguchi
2009/0228919 A1 *	9/2009	Zott H04N 7/17318 725/34	2013/0165164 A1	6/2013	Rowe
2009/0248702 A1	10/2009	Schwartz et al.	2013/0167029 A1	6/2013	Friesen et al.
2009/0249222 A1	10/2009	Schmidt et al.	2013/0173034 A1	7/2013	Reimann et al.
2009/0259765 A1	10/2009	Karlsson et al.	2013/0246916 A1	9/2013	Reimann et al.
2009/0275285 A1	11/2009	Maricevic et al.	2013/0254207 A1	9/2013	Coburn, IV et al.
2010/0005496 A1 *	1/2010	Ellis et al. 725/87	2013/0300546 A1	11/2013	Kim et al.
2010/0009674 A1	1/2010	Sapkota et al.	2013/0326041 A1	12/2013	Bellet et al.
2010/0031366 A1	2/2010	Knight et al.	2013/0346559 A1	12/2013	Van et al.
2010/0042235 A1	2/2010	Basso et al.	2013/0346859 A1	12/2013	Bates et al.
2010/0082725 A1	4/2010	Onishi	2013/0347117 A1	12/2013	Parks et al.
2010/0082731 A1	4/2010	Haughay et al.	2014/0006483 A1	1/2014	Garmark et al.
2010/0087214 A1	4/2010	Bournel et al.	2014/0006947 A1	1/2014	Garmark et al.
2010/0094833 A1	4/2010	Svendsen	2014/0052770 A1	2/2014	Gran et al.
2010/0095332 A1	4/2010	Gran et al.	2014/0075308 A1	3/2014	Sanders et al.
2010/0206815 A1	8/2010	Garusi et al.	2014/0075314 A1	3/2014	Bachman et al.
2010/0211438 A1	8/2010	Lutnick et al.	2014/0080479 A1	3/2014	Vangala et al.
2010/0250669 A1	9/2010	Pan	2014/0096166 A1	4/2014	Gordon et al.
2010/0299402 A1	11/2010	Korman et al.	2014/0108929 A1	4/2014	Garmark et al.
2010/0299639 A1	11/2010	Ramsay et al.	2014/0115462 A1	4/2014	Reznor et al.
2010/0303244 A1	12/2010	Kim et al.	2014/0122737 A1	5/2014	Silberstein et al.
2010/0306815 A1 *	12/2010	Emerson G11B 27/034 725/134	2014/0123005 A1	5/2014	Forstall et al.
2011/0004330 A1	1/2011	Rothkopf et al.	2014/0140530 A1	5/2014	Gomes-Casseres et al.
2011/0047574 A1	2/2011	Tecot et al.	2014/0169569 A1	6/2014	Toivanen et al.
2011/0054641 A1	3/2011	Hur	2014/0195587 A1	7/2014	Sukoff et al.
2011/0055901 A1	3/2011	Karaoguz et al.	2014/0195925 A1	7/2014	Wikander
2011/0060998 A1	3/2011	Schwartz et al.	2014/0215009 A1	7/2014	Zhang
2011/0066943 A1	3/2011	Brillon et al.	2014/0229959 A1	8/2014	Beckhardt et al.
2011/0131272 A1	6/2011	Littlejohn et al.	2014/0378056 A1	12/2014	Liu
2011/0131518 A1	6/2011	Ohashi	2015/0026613 A1	1/2015	Kwon et al.
2011/0131520 A1	6/2011	Al-Shaykh et al.	2015/0074527 A1	3/2015	Sevigny et al.
2011/0179455 A1	7/2011	Thompson	2015/0074528 A1	3/2015	Sakalowsky et al.
2011/0218656 A1	9/2011	Bishop et al.	2015/0256954 A1	9/2015	Carlsson et al.
2011/0225496 A1	9/2011	Jeffe et al.	2015/0286360 A1	10/2015	Wachter
2011/0252118 A1	10/2011	Pantos et al.	2015/0304476 A1	10/2015	Katada
2011/0265003 A1	10/2011	Schubert et al.			

FOREIGN PATENT DOCUMENTS

CN	101212823 A	7/2008
EP	1389853 A1	2/2004
JP	2007060123 A	3/2007
JP	2007512718 A	5/2007

US 9,967,615 B2

Page 4

(56)

References Cited

FOREIGN PATENT DOCUMENTS

JP	2007199220	A	8/2007
JP	2008027537	A	2/2008
JP	2009044410		2/2009
JP	2010067097	A	3/2010
JP	2010510696		4/2010
JP	2012248199	A	12/2012
JP	2013101631	A	5/2013
KR	20090017795		2/2009
WO	0153994		7/2001
WO	2003093950	A2	11/2003
WO	2005013047	A2	2/2005
WO	2008047184	A1	4/2008
WO	2009086599	A1	7/2009
WO	2011049497	A1	4/2011
WO	2013049346	A1	4/2013
WO	2013055661	A1	4/2013
WO	2013101727		7/2013
WO	2014149533	A2	9/2014
WO	2014172462	A1	10/2014

OTHER PUBLICATIONS

"Welcome. You're watching Apple TV." Apple TV 1st Generation Setup Guide, Apr. 8, 2008 <http://manuals.info.apple.com/MANUALS/0/MA403/en_US/AppleTV_SetupGuide.pdf> Retrieved Oct. 14, 2014, 40 pages.

"Welcome. You're watching Apple TV." Apple TV 2nd Generation Setup Guide, Mar. 10, 2011 <http://manuals.info.apple.com/MANUALS/1000/MA1555/en_US/Apple_TV_2nd_gen_Setup_Guide.pdf> Retrieved Oct. 16, 2014, 36 pages.

The United States Patent and Trademark Office, "Non-Final Office Action", issued in connection with U.S. Appl. No. 14/520,566, dated Dec. 30, 2014, 10 pages.

Sonos, Inc., "Sonos Multi-Room Music System User Guide," Version 090401, Apr. 1, 2009, 256 pages.

Sonos, Inc., "Sonos Wireless Dock Product Guide," Version 100101, Oct. 10, 2001, 196 pages.

Australian Intellectual Property Office, "Patent Examination Report No. 1", issued in connection with Australian patent application No. 2012362573, dated Jan. 16, 2015, 3 pages.

The United States Patent and Trademark Office, "Non-Final Office action", issued in connection with U.S. Appl. No. 13/341,237, dated Jan. 25, 2013, 9 pages.

The United States Patent and Trademark Office, "Final Office action", issued in connection with U.S. Appl. No. 13/341,237, dated Aug. 6, 2013, 14 pages.

The United States Patent and Trademark Office, "Advisory action", issued in connection with U.S. Appl. No. 13/341,237, dated Oct. 16, 2013, 3 pages.

The United States Patent and Trademark Office, "Non-Final Office action", issued in connection with U.S. Appl. No. 13/341,237, dated Nov. 26, 2013, 15 pages.

The United States Patent and Trademark Office, "Final Office action", issued in connection with U.S. Appl. No. 13/341,237, dated Apr. 14, 2014, 12 pages.

The United States Patent and Trademark Office, "Non-Final Office action", issued in connection with U.S. Appl. No. 13/341,237, dated Oct. 8, 2014, 18 pages.

Advisory Action dated Dec. 16, 2015, issued in connection with U.S. Appl. No. 13/904,949, filed May 29, 2013, 11 pages.

Advisory Action dated Dec. 2, 2015, issued in connection with U.S. Appl. No. 13/904,936, filed May 29, 2013, 4 pages.

Canadian Office Action dated Nov. 12, 2015, issued in connection with Canadian Application No. 2,861,790, 3 pages.

Final Office Action dated Dec. 7, 2015, issued in connection with U.S. Appl. No. 13/864,075, filed Apr. 16, 2013, 16 pages.

Non-Final Office Action dated Nov. 18, 2015, issued in connection with U.S. Appl. No. 13/904,896, filed May 29, 2013, 18 pages.

Non-Final Office Action dated Nov. 18, 2015, issued in connection with U.S. Appl. No. 13/904,932, filed May 29, 2013, 12 pages.

Non-Final Office Action dated Dec. 28, 2015, issued in connection with U.S. Appl. No. 14/520,566, filed Oct. 22, 2014, 10 pages.

Pre-Interview First Office Action dated Dec. 22, 2015, issued in connection with U.S. Appl. No. 14/520,578, filed Oct. 22, 2014, 9 pages.

Voyetra Turtle Beach, Inc., "AudioTron Quick Start Guide, Version 1.0", Mar. 2001, 24 pages.

Voyetra Turtle Beach, Inc., "AudioTron Reference Manual, Version 3.0", May 2002, 70 pages.

Voyetra Turtle Beach, Inc., "AudioTron Setup Guide, Version 3.0", May 2002, 38 pages.

Bluetooth, "Specification of the Bluetooth System: The ad hoc SCATTERNET for affordable and highly functional wireless connectivity" Core, Version 1.0 A, Jul. 26, 1999, 1068 pages.

Bluetooth, "Specification of the Bluetooth System: Wireless connections made easy" Core, Version 1.0 B, Dec. 1, 1999, 1081 pages.

Dell, Inc., "Dell Digital Audio Receiver: Reference Guide" Jun. 2000, 70 pages.

Dell, Inc., "Start Here" Jun. 2000, 2 pages.

United States Patent and Trademark Office, "Final Office Action", issued in connection with U.S. Appl. No. 13/341,237, dated Apr. 22, 2015, 11 pages.

International Searching Authority, "International Search Report", issued in connection with PCT Application No. PCT/US2014/039669, dated Sep. 22, 2014, 3 pages.

International Searching Authority, "International Search Report", issued in connection with PCT Application No. PCT/US2014/034290, dated Aug. 21, 2014, 3 pages.

International Searching Authority, "International Search Report", issued in connection with PCT Application No. PCT/US2014/034292, dated Aug. 14, 2014, 3 pages.

International Searching Authority, "International Search Report", issued in connection with PCT Application No. PCT/US2014/034372, dated Aug. 20, 2014, 3 pages.

Jo J., et al., "Synchronized One-to-many Media Streaming with Adaptive Playout Control," Proceedings of SPIE, 2002, vol. 4861, pp. 71-82.

Jones, Stephen. "Dell Digital Audio Receiver: Digital upgrade for your analog stereo" Analog Stereo. Jun. 24, 2000 <<http://www.reviewsonline.com/articles/961906864.htm>> retrieved Jun. 18, 2014, 2 pages.

Louderback, Jim. "Affordable Audio Receiver Furnishes Homes With MP3" TechTV Vault. Jun. 28, 2000 <<http://www.g4tv.com/articles/17923/affordable-audio-receiver-furnishes-homes-with-mp3/>> retrieved Jul. 10, 2014, 2 pages.

Motorola, "Simplefi, Wireless Digital Audio Receiver, Installation and User Guide", Dec. 31, 2001, 111 pages.

United States Patent and Trademark Office, "Non-Final Office Action", issued in connection with U.S. Appl. No. 13/864,081, dated Mar. 10, 2015, 13 pages.

United States Patent and Trademark Office, "Non-Final Office Action", issued in connection with U.S. Appl. No. 13/904,949, dated Mar. 13, 2015, 20 pages.

United States Patent and Trademark Office, "Non-Final Office Action", issued in connection with U.S. Appl. No. 13/904,896, dated Mar. 2, 2015, 15 pages.

United States Patent and Trademark Office, "Non-Final Office Action", issued in connection with U.S. Appl. No. 13/904,944, dated Apr. 23, 2015, 12 pages.

Sonos, "SonosTM Digital Music System User Guide", Version: 070101, Sonos, Inc., Jan. 2007, 179 pages.

Palm, Inc. "Handbook for the Palm VII Handheld" May 2000, 311 pages.

Higgins et al., "Presentations at WinHEC 2000" May 2000, 138 pages.

PRISMIQ: Inc., "PRISMIQ Media Player User Guide", 2003, 44 pages.

UPnP, "Universal Plug and Play Device Architecture"; Jun. 8, 2000; version 1.0; Microsoft Corporation, 54 pages.

Apple, Inc., "Welcome. You're watching Apple TV." Apple TV 3rd Generation Setup Guide, Mar. 16, 2012 <<http://manuals.info.apple>.

US 9,967,615 B2

Page 5

(56)

References Cited

OTHER PUBLICATIONS

com/MANUALS/1000/MA1607/en_US/apple_tv_3rd_gen_setup.pdf> Retrieved Oct. 16, 2014, 36 pages.

International Searching Authority, "Written Opinion", issued in connection with PCT Application No. PCT/US2014/039669, dated Sep. 22, 2014, 5 pages.

International Searching Authority, "Written Opinion", issued in connection with PCT Application No. PCT/US2014/034290, dated Aug. 21, 2014, 5 pages.

International Searching Authority, "Written Opinion", issued in connection with PCT Application No. PCT/US2014/034292, dated Aug. 14, 2014, 4 pages.

International Searching Authority, "Written Opinion", issued in connection with PCT Application No. PCT/US2014/034290, dated Aug. 20, 2014, 6 pages.

European Patent Office, "The Extended European Search Report", issued in connection with European patent application No. 12861517.6, dated Jun. 9, 2015, 11 pages.

"Final Office Action dated Aug. 25, 2015, issued in connection with U.S. Appl. No. 13/864,081, filed Apr. 16, 2013, 15 pages."

"Non-Final Office Action dated Aug. 19, 2015, issued in connection with U.S. Appl. No. 13/864,075, filed Apr. 16, 2013, 18 pages."

Final Office Action dated Aug. 28, 2015, issued in connection with U.S. Appl. No. 13/904,936, filed May 29, 2013, 10 pages.

Non-Final Office Action dated Feb. 13, 2015, issued in connection with U.S. Appl. No. 13/904,936, filed May 29, 2013, 10 pages.

Non-Final Office Action dated Mar. 24, 2015, issued in connection with U.S. Appl. No. 13/864,086, filed Apr. 16, 2013, 14 pages.

"Advisory Action dated Sep. 17, 2015, issued in connection with U.S. Appl. No. 14/520,566, filed Oct. 22, 2014, 4 pages."

"Final Office Action dated Sep. 25, 2015, issued in connection with U.S. Appl. No. 13/904,949, filed May 29, 2013, 14 pages."

"Advisory Action dated Oct. 29, 2015, issued in connection with U.S. Appl. No. 13/864,081, filed Apr. 16, 2013, 3 pages."

"Final Office Action dated Oct. 23, 2015, issued in connection with U.S. Appl. No. 13/904,944, filed May 29, 2013, 13 pages."

International Bureau, International Preliminary Report on Patentability, dated Oct. 29, 2015, issued in connection with International Application No. PCT/US2014/034290, filed on Apr. 16, 2014, 7 pages.

International Bureau, International Preliminary Report on Patentability, dated Oct. 29, 2015, issued in connection with International Application No. PCT/US2014/034292, filed on Apr. 16, 2014, 6 pages.

International Bureau, International Preliminary Report on Patentability, dated Oct. 29, 2015, issued in connection with International Application No. PCT/US2014/034372, filed on Apr. 16, 2014, 8 pages.

Notice of Allowance dated Oct. 9, 2015, issued in connection with U.S. Appl. No. 13/864,086, filed Apr. 16, 2013, 14 pages.

Supplemental Notice of Allowability dated Nov. 4, 2015, issued in connection with U.S. Appl. No. 13/864,086, filed Apr. 16, 2013, 2 pages.

Japanese Office Action dated Oct. 20, 2015, issued in connection with Japanese Application No. 2014-550400, 8 pages.

Final Office Action dated Jul. 8, 2015, issued in connection with U.S. Appl. No. 14/520,566, filed Oct. 22, 2014, 8 pages.

Final Office Action dated Jun. 23, 2015, issued in connection with U.S. Appl. No. 13/904,896, filed May 29, 2013, 16 pages.

Advisory Action dated Jun. 16, 2016, issued in connection with U.S. Appl. No. 13/904,896, filed May 29, 2013, 5 pages.

Advisory Action dated Apr. 29, 2016, issued in connection with U.S. Appl. No. 13/864,075, filed Apr. 16, 2013, 3 pages.

Anonymous, "Sonos Controller for Mac or PC Product Guide", Retrieved from the Internet, XP055254086, 2013, 108 pages.

European Patent Office, Exam Report dated Apr. 28, 2016, issued in connection with European Patent Application No. 12861517.6, 6 pages.

European Patent Office, Extended European Search Report dated Jun. 7, 2016, issued in connection with European patent application No. 14803651.0, 10 pages.

Final Office Action dated Jun. 2, 2016, issued in connection with U.S. Appl. No. 14/520,566, filed Oct. 22, 2014, 12 pages.

Final Office Action dated May 19, 2016, issued in connection with U.S. Appl. No. 14/520,578, filed Oct. 22, 2014, 12 pages.

First Action Interview Office Action dated Jun. 20, 2016, issued in connection with U.S. Appl. No. 14/520,578, filed Oct. 22, 2014, 5 pages.

Non-Final Office Action dated Jun. 16, 2016, issued in connection with U.S. Appl. No. 13/904,932, filed May 29, 2013, 15 pages.

Notice of Allowance dated Jun. 6, 2016, issued in connection with U.S. Appl. No. 13/904,944, filed May 29, 2013, 5 pages.

Notice of Allowance dated Jun. 13, 2016, issued in connection with U.S. Appl. No. 13/864,075, filed Apr. 16, 2013, 11 pages.

Non-Final Office Action dated Feb. 2, 2016, issued in connection with U.S. Appl. No. 13/904,936, filed May 29, 2013, 14 pages.

Non-Final Office Action dated Jan. 19, 2016, issued in connection with U.S. Appl. No. 13/341,237, filed Dec. 30, 2011, 10 pages.

Advisory Action dated Feb. 25, 2016, issued in connection with U.S. Appl. No. 13/904,944, filed May 29, 2013, 4 pages.

"Final Office Action dated Mar. 10, 2016, issued in connection with U.S. Appl. No. 13/904,932, filed May 29, 2013, 16 pages".

Notice of Allowance dated Feb. 26, 2016, issued in connection with U.S. Appl. No. 13/864,081, filed Apr. 16, 2013, 13 pages.

Final Office Action dated Mar. 21, 2016, issued in connection with U.S. Appl. No. 13/904,896, filed May 29, 2013, 19 pages.

Non-Final Office Action dated Mar. 17, 2016, issued in connection with U.S. Appl. No. 13/904,923, filed May 29, 2013, 15 pages.

Non-Final Office Action dated Mar. 25, 2016, issued in connection with U.S. Appl. No. 13/904,949, filed May 29, 2013, 13 pages.

Chen et al., "What a Juke! A Collaborative Music Sharing System," World of Wireless, Mobile and Multimedia Networks (WOWMOM), 2012 IEEE International Symposium, 2012, 6 pages.

Corrected Notice of Allowance dated Oct. 6, 2016, issued in connection with U.S. Appl. No. 13/904,949, filed May 29, 2013, 9 pages.

European Patent Office, Extended European Search Report dated Sep. 9, 2016, issued in connection with European patent application No. 14785247.9, 10 pages.

European Patent Office, Extended European Search Report dated Oct. 18, 2016, issued in connection with European patent application No. 14785806.2, 9 pages.

Final Office Action dated Sep. 21, 2016, issued in connection with U.S. Appl. No. 13/904,923, filed May 29, 2013, 19 pages.

Notice of Allowance dated Nov. 7, 2016, issued in connection with U.S. Appl. No. 14/520,578, filed Oct. 22, 2014, 14 pages.

Notice of Allowance dated Sep. 20, 2016, issued in connection with U.S. Appl. No. 13/904,949, filed May 29, 2013, 12 pages.

European Patent Office, Extended European Search Report dated Aug. 1, 2016, issued in connection with European patent application No. 16160758.5, 11 pages.

Final Office Action dated Aug. 24, 2016, issued in connection with U.S. Appl. No. 13/341,237, filed Dec. 30, 2011, 12 pages.

Final Office Action dated Aug. 29, 2016, issued in connection U.S. Appl. No. 13/904,936, filed May 29, 2013, 21 pages.

International Searching Authority, International Report on Patentability dated Dec. 10, 2015, issued in connection with International Application No. PCT/US2014/039669, filed May 28, 2014, 7 pages.

Japanese Patent Office, Japanese Office Action dated Jul. 12, 2016, issued in connection with Japanese Application No. 2014-550400, 10 pages.

Non-Final Office Action dated Aug. 12, 2016, issued in connection with U.S. Appl. No. 13/904,909, filed May 29, 2013, 21 pages.

Notice of Allowance dated Aug. 31, 2016, issued in connection with U.S. Appl. No. 14/520,566, filed Oct. 22, 2014, 7 pages.

Ritchie et al., "UPnP AV Architecture:2 for UPnP Version 1.0", 2010, XP055032201, retrieved from the internet: URL: http://upnp.org/specs/av/UPnP-av_AVArchitecture-v2.pdf, 11 pages.

Advisory Action dated Dec. 5, 2016, issued in connection with U.S. Appl. No. 13/904,923, filed May 29, 2013, 5 pages.

US 9,967,615 B2

Page 6

(56)

References Cited

OTHER PUBLICATIONS

Canadian Patent Office, Canadian Office Action dated Nov. 3, 2016, issued in connection with Canadian Application No. 2,861,790, 4 pages.

European Patent Office, Extended European Search Report dated Nov. 21, 2016, issued in connection with European Application No. 14784965.7-1870, 6 pages.

European Patent Office, Summons to Attend Oral Proceedings dated Dec. 1, 2016, issued in connection with European Application No. 12861517.6-1905, 11 pages.

Japanese Patent Office, Notice of Rejection dated Dec. 20, 2016, issued in connection with Japanese Application No. 2016-509069, 4 pages.

"Denon 2003-2004 Product Catalog," Denon, 2003-2004, 44 pages.

Mate et al., "Movable-Multimedia: Session Mobility in Ubiquitous Computing Ecosystem", XP055019030, 2006, 6 pages.

Non-Final Office Action dated Dec. 14, 2016, issued in connection with U.S. Appl. No. 13/341,237, filed Dec. 30, 2011, 5 pages.

Notice of Allowance dated Nov. 17, 2016, issued in connection with U.S. Appl. No. 13/904,949, filed May 29, 2013, 12 pages.

Notice of Allowance dated Nov. 23, 2016, issued in connection with U.S. Appl. No. 13/904,896, filed May 29, 2013, 18 pages.

Notice of Allowance dated Nov. 23, 2016, issued in connection with U.S. Appl. No. 13/904,932, filed May 29, 2013, 5 pages.

Notification of Reopening of Prosecution Due to Consideration of an Information Disclosure Statement Filed after Mailing of a Notice of Allowance dated Jan. 20, 2017, issued in connection with U.S. Appl. No. 14/520,566, filed Oct. 22, 2014, 2 pages.

Supplemental Notice of Allowance dated Dec. 21, 2016, issued in connection with U.S. Appl. No. 13/904,949, filed May 29, 2013, 2 pages.

United States Patent and Trademark Office, U.S. Appl. No. 60/490,768, filed Jul. 28, 2003, entitled "Method for synchronizing audio playback between multiple networked devices," 13 pages.

United States Patent and Trademark Office, U.S. Appl. No. 60/825,407, filed Sep. 12, 2003, entitled "Controlling and manipulating groupings in a multi-zone music or media system," 82 pages.

Yamaha DME 64 Owner's Manual; copyright 2004, 80 pages.

Yamaha DME Designer 3.5 setup manual guide; copyright 2004, 16 pages.

Yamaha DME Designer 3.5 User Manual; Copyright 2004, 507 pages.

Australian Patent Office, Examination Report dated Mar. 22, 2017, issued in connection with Australian Application No. 2016202175, 3 pages.

Chen, Zhaofei et al. "What a Juke! A Collaborative Music Sharing System", World of Wireless, Mobile and Multimedia Networks (WOWMOM), 2012 IEEE International Symposium on A, IEEE, Jun. 25, 2012 6 pages.

Chinese Patent Office, Chinese Office Action dated Jan. 5, 2017, issued in connection with Chinese Application No. 201280069674.6, 14 pages.

European Patent Office, European Extended Search Report dated Aug. 16, 2017, issued in connection with EP Application No. 16160758.5, 9 pages.

European Patent Office, Office Action dated Apr. 7, 2017, issued in connection with European Application No. 14803651.0, 4 pages.

European Patent Office, Office Action dated May 11, 2017, issued in connection with European Application No. 14785247.9, 9 pages.

Final Office Action dated May 15, 2017, issued in connection with U.S. Appl. No. 14/520,566, filed Oct. 22, 2014, 12 pages.

Final Office Action dated Sep. 20, 2017, issued in connection with U.S. Appl. No. 13/904,936, filed May 29, 2013, 22 pages.

Japanese Patent Office, Non-Final Office Action dated Mar. 28, 2017, issued in connection with Japanese Patent Application No. 2016-516750, 5 pages.

Japanese Patent Office, Office Action dated Jan. 10, 2017, issued in connection with Japanese Patent Application No. 2016-509046, 7 pages.

Japanese Patent Office, Office Action dated Feb. 14, 2017, issued in connection with Japanese Patent Application No. 2016-509047, 9 pages.

Non-Final Office Action dated Feb. 23, 2017, issued in connection with U.S. Appl. No. 13/904,923, filed May 29, 2013, 21 pages.

Non-Final Office Action dated Feb. 7, 2017, issued in connection with U.S. Appl. No. 14/520,578, filed Oct. 22, 2014, 5 pages.

Non-Final Office Action dated Mar. 9, 2017, issued in connection with U.S. Appl. No. 13/904,936, filed May 29, 2013, 20 pages.

Non-Final Office Action dated Feb. 22, 2017, issued in connection with U.S. Appl. No. 14/520,566, filed Oct. 22, 2014, 14 pages.

Non-Final Office Action dated Jul. 26, 2017, issued in connection with U.S. Appl. No. 14/520,578, filed Oct. 22, 2014, 10 pages.

Notice of Allowance dated Apr. 4, 2017, issued in connection with U.S. Appl. No. 13/904,932, filed May 29, 2013, 5 pages.

Notice of Allowance dated Mar. 9, 2017, issued in connection with U.S. Appl. No. 13/904,949, filed May 29, 2013, 13 pages.

Notice of Allowance dated Aug. 17, 2017, issued in connection with U.S. Appl. No. 13/904,923, filed May 29, 2013, 23 pages.

Notice of Allowance dated Aug. 21, 2017, issued in connection with U.S. Appl. No. 14/520,566, filed Oct. 22, 2014, 7 pages.

Notice of Allowance dated Jan. 25, 2017, issued in connection with U.S. Appl. No. 13/341,237, filed Dec. 30, 2011, 7 pages.

Notice of Allowance dated Jun. 28, 2017, issued in connection with U.S. Appl. No. 13/904,896, filed May 29, 2013, 17 pages.

* cited by examiner

U.S. Patent

May 8, 2018

Sheet 1 of 11

US 9,967,615 B2

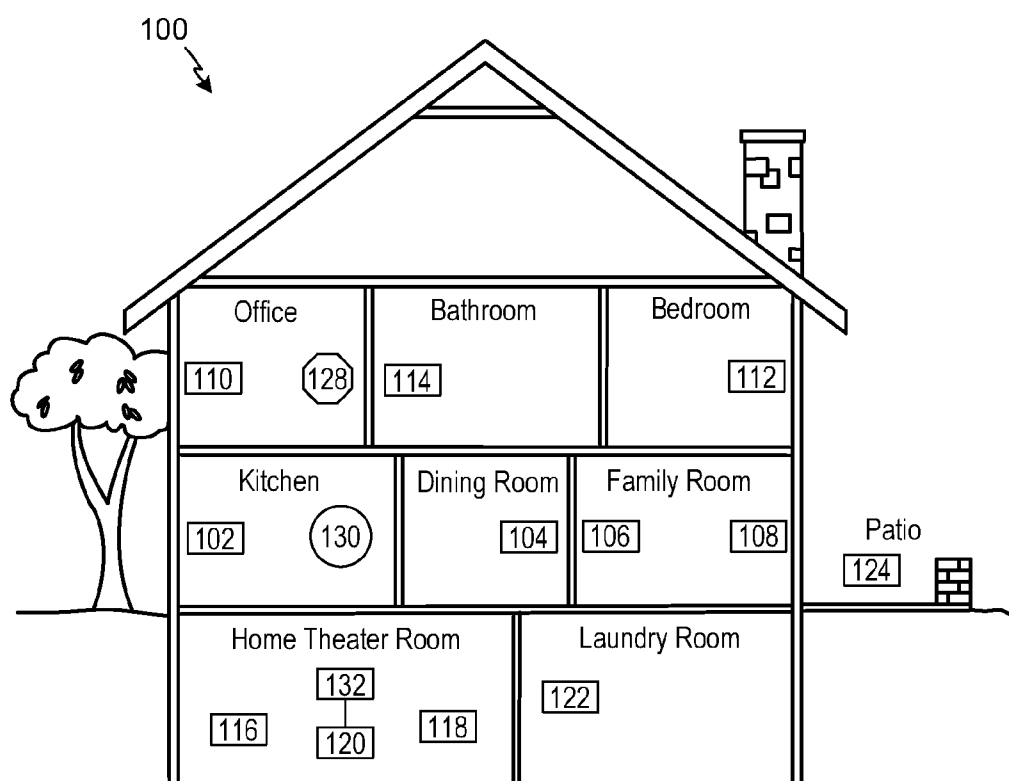


FIGURE 1

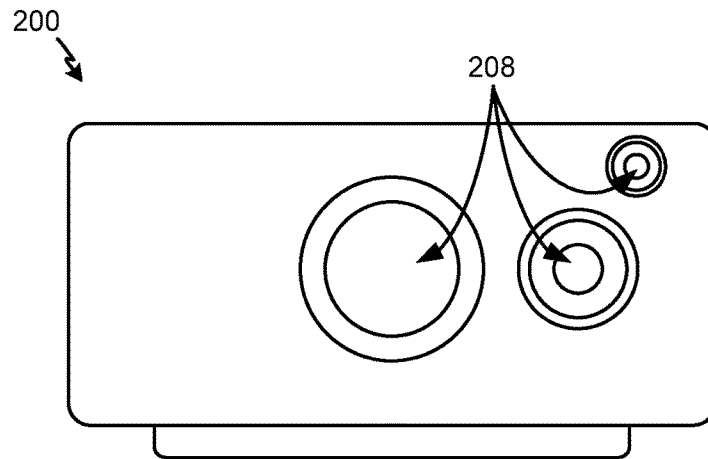


FIGURE 2A

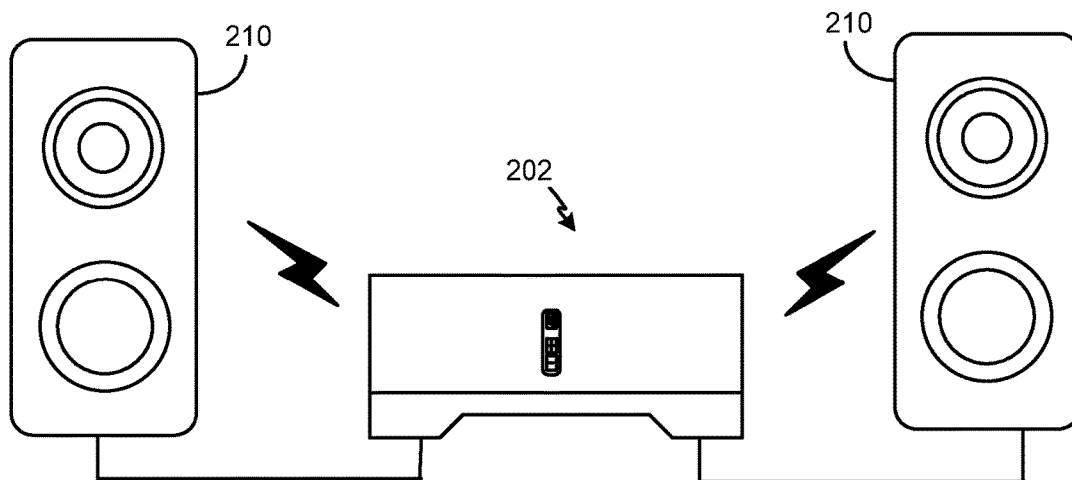


FIGURE 2B

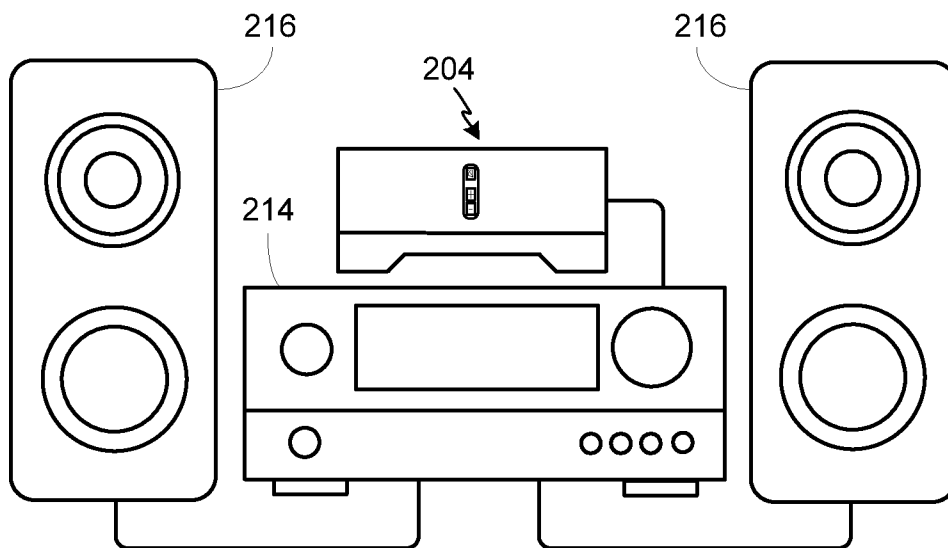


FIGURE 2C

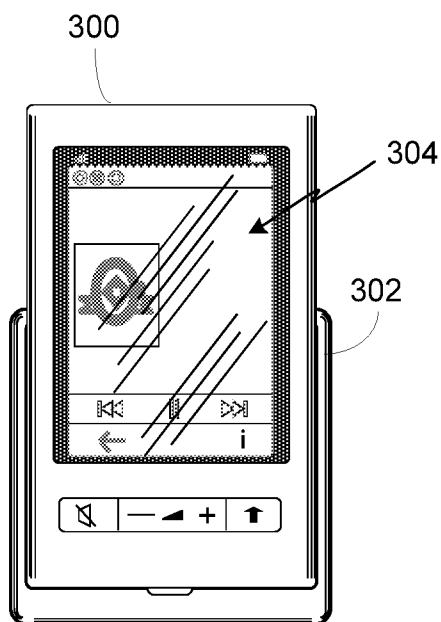


FIGURE 3

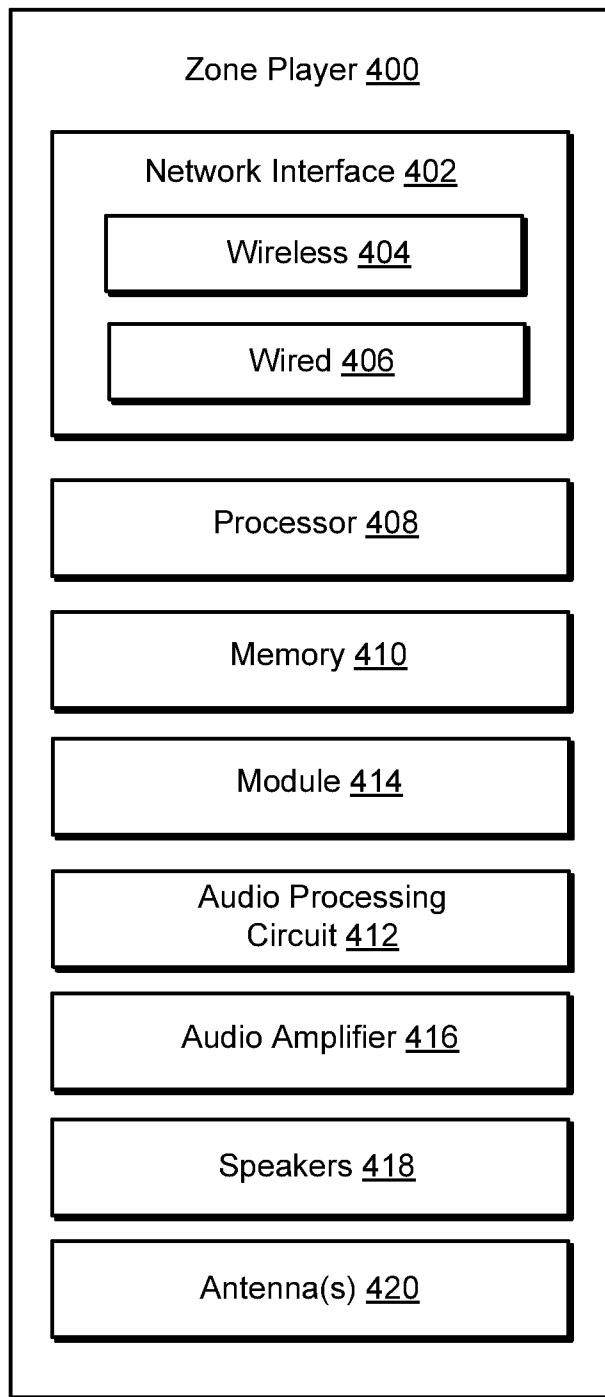


FIGURE 4

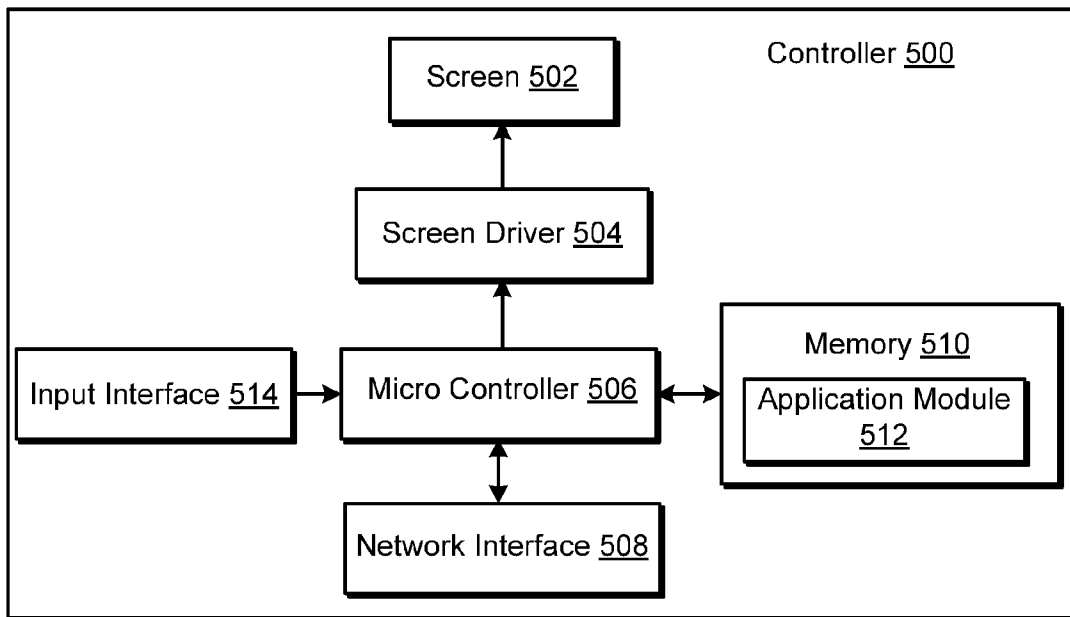


FIGURE 5

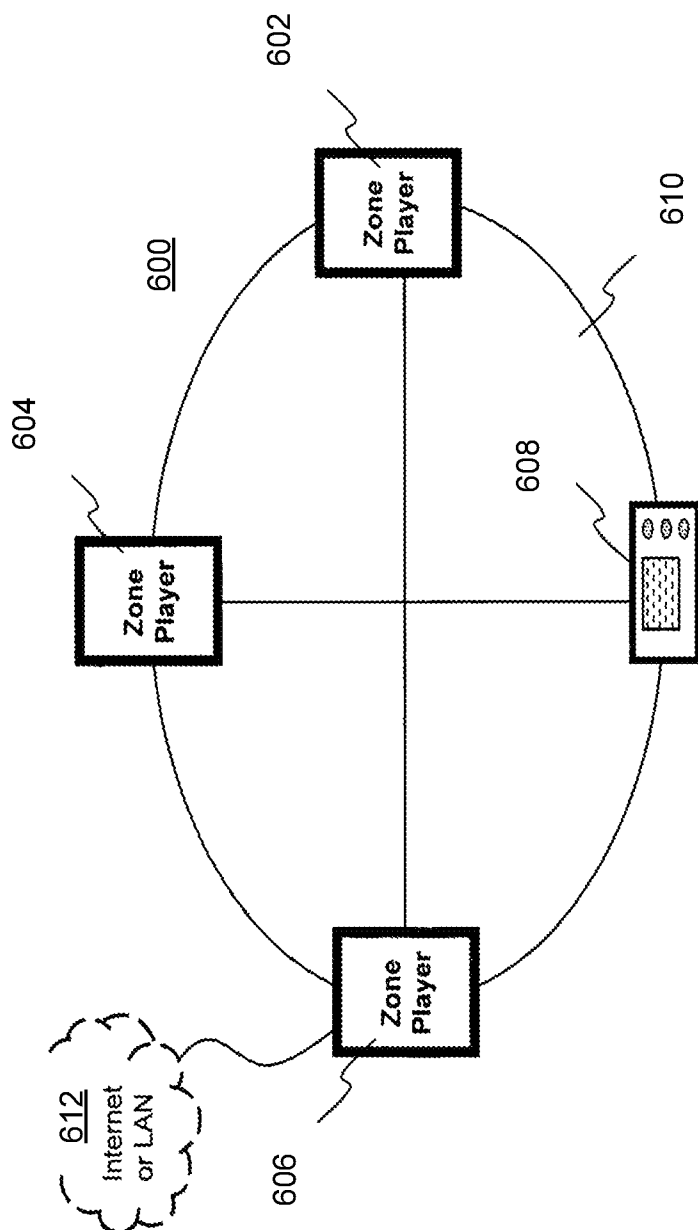


FIGURE 6

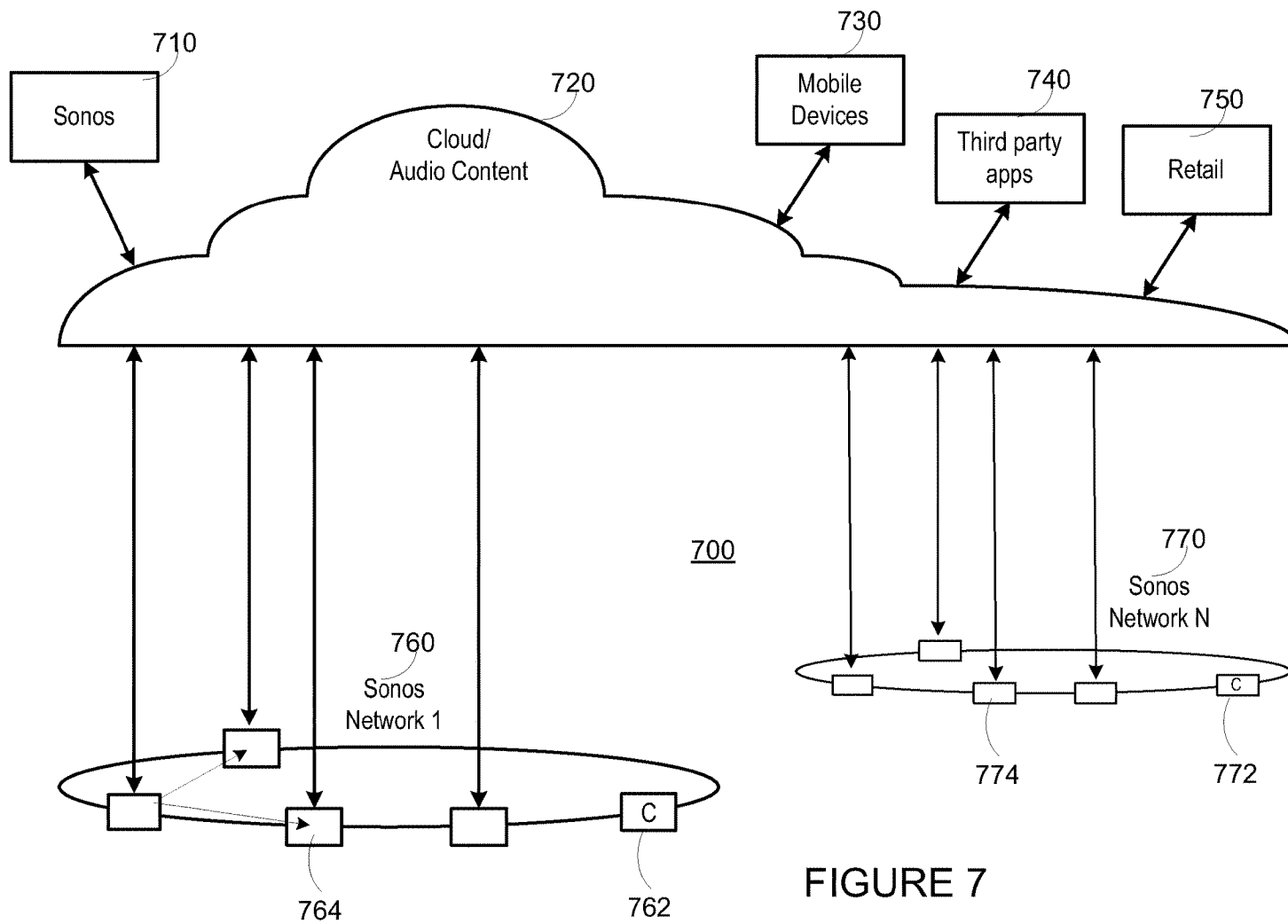


FIGURE 7

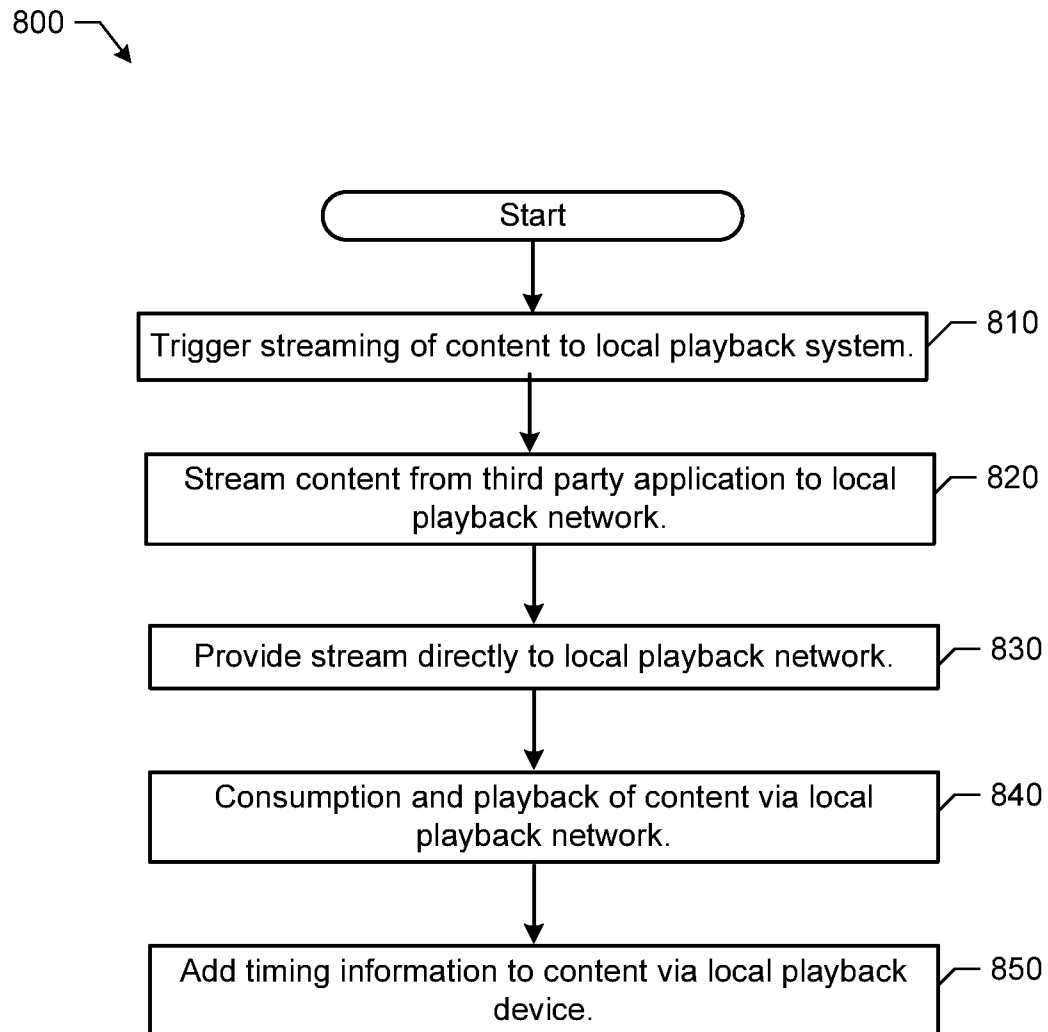


FIGURE 8

900 ↘

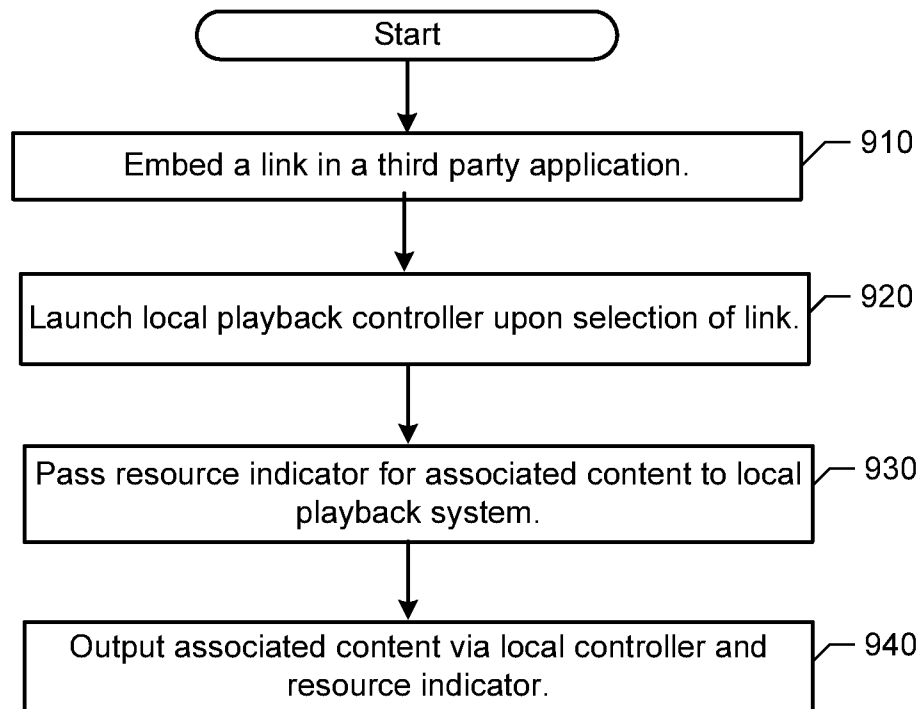


FIGURE 9

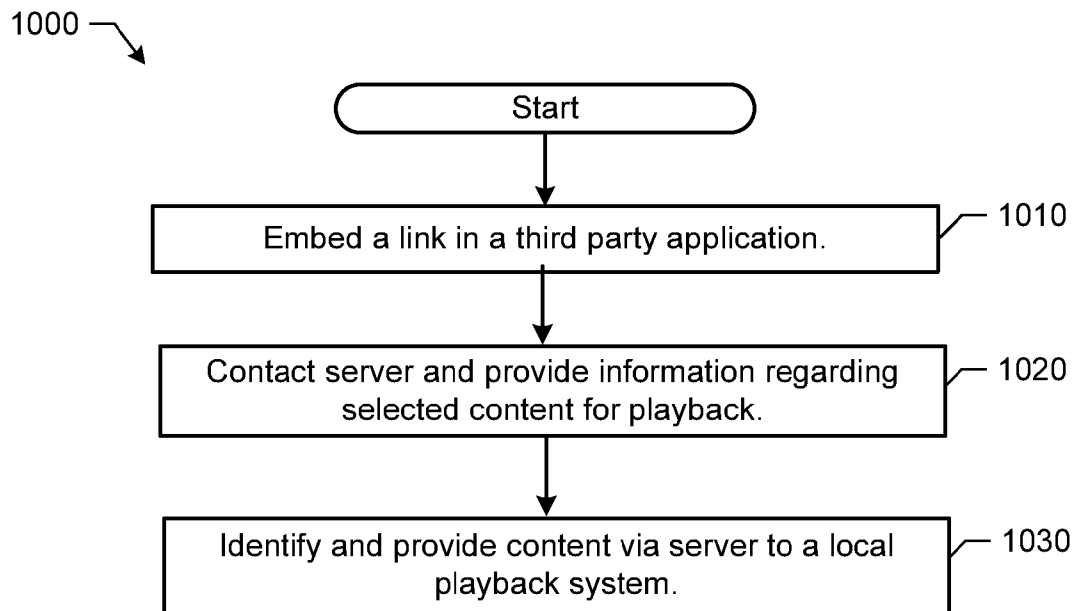


FIGURE 10

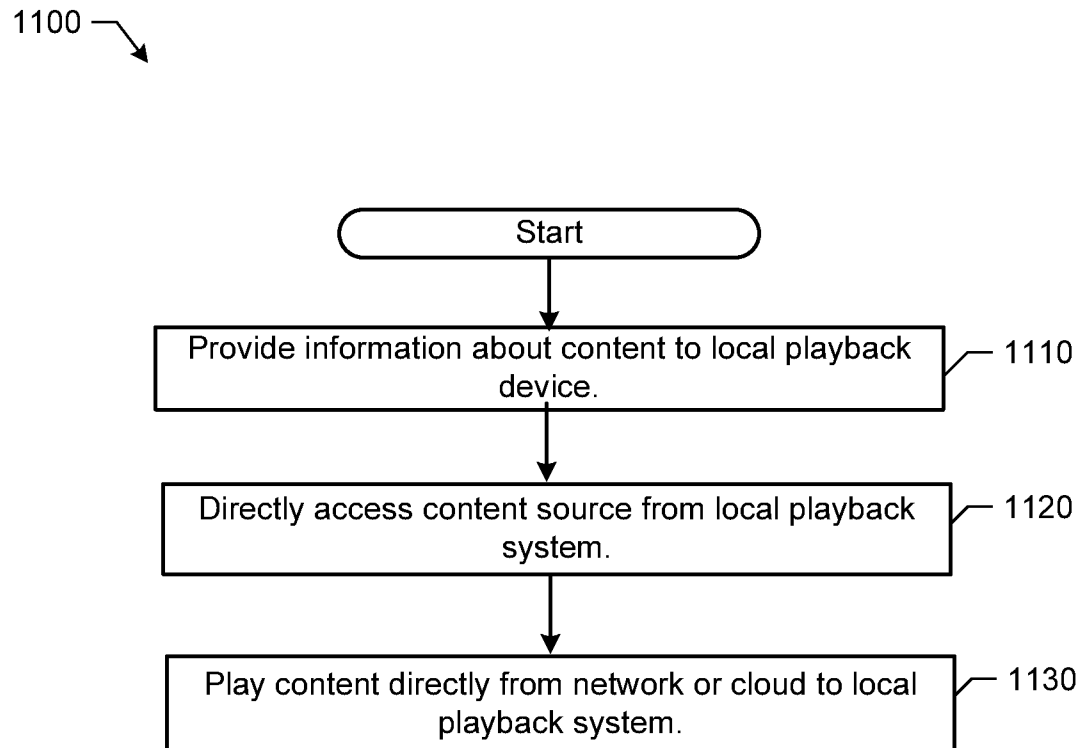


FIGURE 11

US 9,967,615 B2

1

NETWORKED MUSIC PLAYBACK

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application claims the benefit of priority to U.S. Non-Provisional application Ser. No. 13/341,237, filed on Dec. 30, 2011, entitled "Systems and Methods for Networked Music Playback", which is hereby incorporated by reference in its entirety for all purposes.

FIELD OF THE DISCLOSURE

The disclosure is related to consumer electronics and, more particularly, to providing music for playback via one or more devices on a playback data network.

BACKGROUND

Technological advancements have increased the accessibility of music content, as well as other types of media, such as television content, movies, and interactive content. For example, a user can access audio, video, or both audio and video content over the Internet through an online store, an Internet radio station, an online music service, an online movie service, and the like, in addition to the more traditional avenues of accessing audio and video content. Demand for such audio and video content continues to surge. Given the high demand, technology used to access and play such content has likewise improved.

BRIEF DESCRIPTION OF THE DRAWINGS

Features, aspects, and advantages of the presently disclosed technology are better understood with regard to the following description, appended claims, and accompanying drawings where:

FIG. 1 shows an illustration of an example system in which embodiments of the methods and apparatus disclosed herein can be implemented;

FIG. 2A shows an illustration of an example zone player having a built-in amplifier and speakers;

FIG. 2B shows an illustration of an example zone player having a built-in amplifier and connected to external speakers;

FIG. 2C shows an illustration of an example zone player connected to an A/V receiver and speakers;

FIG. 3 shows an illustration of an example controller;

FIG. 4 shows an internal functional block diagram of an example zone player;

FIG. 5 shows an internal functional block diagram of an example controller;

FIG. 6 shows an example ad-hoc playback network;

FIG. 7 shows a system including a plurality of networks including a cloud-based network and at least one local playback network; and

FIGS. 8-11 show flow diagrams for methods to provide audio content to a local playback system.

In addition, the drawings are for the purpose of illustrating example embodiments, but it is understood that the present disclosure is not limited to the arrangements and instrumentality shown in the drawings.

DETAILED DESCRIPTION

I. Overview

Wired or wireless networks can be used to connect one or more multimedia playback devices for a home or other

2

location playback network (e.g., a home music system). Certain examples provide automatic configuration of parameters of a playback device to be coupled to a network with reduced or minimum human intervention. For example, a wired and/or wireless ad-hoc network is established to facilitate communications among a group of devices. Music and/or other multimedia content can be shared among devices and/or groups of devices (also referred to herein as zones) associated with a playback network.

Certain embodiments facilitate streaming or otherwise providing music from a music-playing application (e.g., browser-based application, native music player, other multimedia application, and so on) to a multimedia content playback (e.g., Sonos™) system. Certain embodiments provide simple, easy-to-use and secure systems and methods for multimedia content playback across a plurality of systems and locations. Certain embodiments facilitate integration between content partners and a playback system as well as supporting maintenance of such content and system.

Although the following discloses example systems, methods, apparatus, and articles of manufacture including, among other components, firmware and/or software executed on hardware, it should be noted that such systems, methods, apparatus, and/or articles of manufacture are merely illustrative and should not be considered as limiting. For example, it is contemplated that any or all of these firmware, hardware, and/or software components could be embodied exclusively in hardware, exclusively in software, exclusively in firmware, or in any combination of hardware, software, and/or firmware. Accordingly, while the following describes example systems, methods, apparatus, and/or articles of manufacture, the examples provided are not the only way(s) to implement such systems, methods, apparatus, and/or articles of manufacture.

When any of the appended claims are read to cover a purely software and/or firmware implementation, at least one of the elements in at least one example is hereby expressly defined to include a tangible medium such as a memory, DVD, CD, Blu-ray, and so on, storing the software and/or firmware.

Reference herein to "embodiment" means that a particular feature, structure, or characteristic described in connection with the embodiment can be included in at least one example embodiment of the invention. The appearances of this phrase in various places in the specification are not necessarily all referring to the same embodiment, nor are separate or alternative embodiments mutually exclusive of other embodiments. As such, the embodiments described herein, explicitly and implicitly understood by one skilled in the art, can be combined with other embodiments.

Certain embodiments provide a method to provide content to a local playback network. The example method includes identifying multimedia content from a content provider. The example method includes passing information regarding the multimedia content to a local playback system including one or more multimedia playback devices in response to a trigger. The example method includes facilitating play of the multimedia content via a local playback network associated with the local playback system.

Certain embodiments provide a computer readable storage medium including instructions for execution by a processor, the instructions, when executed, cause the processor to implement a method to provide content to a local playback network. The example method includes identifying multimedia content from a content provider. The example method includes passing information regarding the multimedia content to a local playback system including one or

more multimedia playback devices in response to a trigger. The example method includes facilitating play of the multimedia content via a local playback network associated with the local playback system.

Certain embodiments provide a multimedia playback device including a wireless communication interface to communicate with a local playback network and a multimedia content source and a processor. The process is to identify multimedia content from the multimedia content source; pass information regarding the multimedia content to device on the local playback network in response to a trigger; and facilitate play of the multimedia content via the devices on the local playback network.

II. Example Environment

Referring now to the drawings, in which like numerals can refer to like parts throughout the figures, FIG. 1 shows an example system configuration 100 in which one or more of the method and/or apparatus disclosed herein can be practiced or implemented. By way of illustration, the system configuration 100 represents a home with multiple zones. Each zone, for example, represents a different room or space, such as an office, bathroom, bedroom, kitchen, dining room, family room, home theater room, utility or laundry room, and patio. While not shown here, a single zone can cover more than one room or space. One or more of zone players 102-124 are shown in each respective zone. A zone player 102-124, also referred to as a playback device, multimedia unit, speaker, and so on, provides audio, video, and/or audiovisual output. A controller 130 (e.g., shown in the kitchen for purposes of illustration) provides control to the system configuration 100. The system configuration 100 illustrates an example whole house audio system, though it is understood that the technology described herein is not limited to its particular place of application or to an expansive system like a whole house audio system 100 of FIG. 1.

FIGS. 2A, 2B, and 2C show example illustrations of zone players 200-204. The zone players 200-204 of FIGS. 2A, 2B, and 2C, respectively, can correspond to any of the zone players 102-124 of FIG. 1. While certain embodiments provide multiple zone players, an audio output can be generated using only a single zone player. FIG. 2A illustrates a zone player 200 including sound producing equipment 208 capable of generating sound or an audio output corresponding to a signal received (e.g., wirelessly and/or via a wired interface). The sound producing equipment 208 of the zone player 200 of FIG. 2A includes a built-in amplifier (not shown in this illustration) and speakers (e.g., a tweeter, a mid-range driver, and/or a subwoofer). In certain embodiments, the zone player 200 of FIG. 2A can be configured to play stereophonic audio or monaural audio. In some embodiments, the zone player 200 of FIG. 2A can be configured as a component in a combination of zone players to play stereophonic audio, monaural audio, and/or surround audio. As described in greater detail below, in some embodiments, the example zone player 200 of FIG. 2A can also transmit a second signal to, for example, other zone player(s) in the same or different zone(s), speaker(s), receiver(s), and so on. Transmission of the second signal can be part of, for example, a system in which multiple zone players, speakers, receivers, and so on, form a network to, for example, present media content in a synchronization or distributed manner.

The example zone player 202 of FIG. 2B includes a built-in amplifier (not shown in this illustration) to power a set of detached speakers 210. The speakers 210 of FIG. 2B

can include, for example, any type of loudspeaker. The zone player 202 of FIG. 2B can communicate a signal corresponding to audio content to the detached speakers 210 via wired and/or wireless channels. Instead of receiving and generating audio content as in FIG. 2A, the zone player 202 of FIG. 2B receives the audio content and transmits the same (e.g., after processing the received signal) to the detached speakers 210. Similar to the example zone player 200 of FIG. 2A, in some embodiments the zone player 202 can transmit a second signal to, for example, other zone player(s) in the same or different zone(s), speaker(s), receiver(s), and so on.

The example zone player 204 of FIG. 2C does not include an amplifier, but allows a receiver 214, or another audio and/or video type device with built-in amplification, to connect to a data network 128 of FIG. 1 and to play audio received over the data network 128 via the receiver 214 and a set of detached speakers 216. In addition to the wired couplings shown in FIG. 2C, the detached speakers 216 can receive audio content via a wireless communication channel between the detached speakers 216 and, for example, the zone player 204 and/or the receiver 214. In some embodiments the zone player 202 can transmit a second signal to, for example, other zone player(s) in the same or different zone(s), speaker(s), receiver(s), and so on.

Example zone players include a "Sonos S5," "Sonos Play:5," "Sonos Play:3," "ZonePlayer 120," and "ZonePlayer 90," which are offered by Sonos, Inc. of Santa Barbara, Calif. Any other past, present, and/or future zone players can additionally or alternatively be used to implement the zone players of example embodiments disclosed herein. A zone player can also be referred to herein as a playback device, and a zone player is not limited to the particular examples illustrated in FIGS. 2A, 2B, and 2C. For example, a zone player can include a wired or wireless headphone. In other examples, a zone player might include a subwoofer. In yet other examples, a zone player can include a sound bar. In an example, a zone player can include or interact with a docking station for an Apple iPod™ or similar device. In some embodiments, a zone player can relay one or more signals received from, for example, a first zone player to another playback device. In some embodiments, a zone player can receive a first signal and generate an output corresponding to the first signal and, simultaneously or separately, can receive a second signal and transmit or relay the second signal to another zone player(s), speaker(s), receiver(s), and so on. Thus, an example zone player described herein can act as a playback device and, at the same time, operate as a hub in a network of zone players. In such instances, media content corresponding to the first signal can be different from the media content corresponding to the second signal.

FIG. 3 shows an example illustration of a wireless controller 300 in a docking station 302. The controller 300 can correspond to the controlling device 130 of FIG. 1. The controller 300 is provided with a touch screen 304 that allows a user to interact with the controller 300, for example, to retrieve and navigate a playlist of audio items, control operations of one or more zone players, and provide overall control of the system configuration 100. In certain embodiments, any number of controllers can be used to control the system configuration 100. In certain embodiments, there can be a limit on the number of controllers that can control the system configuration 100. The controllers might be wireless like wireless controller 300 or wired to the data network 128. Furthermore, an application running on any network-enabled portable devices, such as an iPhone™ iPad™

US 9,967,615 B2

5

Android™ powered phone, or any other smart phone or network-enabled device can be used as a controller by connecting to the data network **128**. An application running on a laptop or desktop PC or Mac can also be used as a controller. Example controllers include a “Sonos® Controller 200,” “Sonos® Controller for iPhone,” “Sonos® Controller for iPad,” “Sonos® Controller for Android,” “Sonos® Controller for Mac or PC,” which are offered by Sonos, Inc. of Santa Barbara, Calif. The flexibility of such an application and its ability to be ported to a new type of portable device is advantageous.

Referring back to the system configuration **100** of FIG. 1, a particular zone can contain one or more zone players. For example, the family room of FIG. 1 contains two zone players **106** and **108**, while the kitchen is shown with one zone player **102**. Zones can be dynamically configured by positioning a zone player in a room or space and assigning via the controller **130** the zone player to a new or existing zone. As such, zones can be created, combined with another zone, removed, and given a specific name (e.g., “Kitchen”), if so programmed. The zone players **102** to **124** are coupled directly or indirectly to a data network, such as the data network **128** shown in FIG. 1. The data network **128** is represented by an octagon in the figure to stand out from other components shown in the figure. While the data network **128** is shown in a single location, it is understood that such a network can be distributed in and around the system configuration **100**.

Particularly, the data network **128** can be a wired network, a wireless network, or a combination of both. In some embodiments, one or more of the zone players **102-124** are wirelessly coupled to the data network **128** based on a proprietary mesh network. In some embodiments, one or more of the zone players **102-124** are wirelessly coupled to the data network **128** using a non-mesh topology. In some embodiments, one or more of the zone players **102-124** are coupled via a wire to the data network **128** using Ethernet or similar technology. In addition to the one or more zone players **102-124** connecting to the data network **128**, the data network **128** can further allow access to a wide area network, such as the Internet.

In certain embodiments, the data network **128** can be created by connecting any of the zone players **102-124**, or some other connecting device, to a broadband router. Other zone players **102-124** can then be added wired or wirelessly to the data network **128**. For example, a zone player (e.g., any of zone players **102-124**) can be added to the system configuration **100** by simply pressing a button on the zone player itself, which enables a connection to be made to the data network **128**. The broadband router can be connected to an Internet Service Provider (ISP), for example. The broadband router can be used to form another data network within the system configuration **100**, which can be used in other applications (e.g., web surfing). The data network **128** can also be used in other applications, if so programmed. Further, in certain embodiments, the data network **128** is the same network used for other applications in the household.

In certain embodiments, each zone can play from the same audio source as another zone or each zone can play from a different audio source. For example, someone can be grilling on the patio and listening to jazz music via zone player **124**, while someone is preparing food in the kitchen and listening to classical music via zone player **102**. Further, someone can be in the office listening to the same jazz music via zone player **110** that is playing on the patio via zone player **124**. In some embodiments, the jazz music played via zone players **110** and **124** is played in synchrony. Synchrony-

6

izing playback amongst zones allows for someone to pass through zones while seamlessly listening to the audio. Further, zones can be put into a “party mode” such that all associated zones will play audio in synchrony.

In certain embodiments, a zone contains two or more zone players. For example, the family room contains two zone players **106** and **108**, and the home theater room contains at least zone players **116**, **118**, and **120**. A zone can be configured to contain as many zone players as desired, and for example, the home theater room might contain additional zone players to play audio from a 5.1 channel or greater audio source (e.g., a movie encoded with 5.1 or greater audio channels). If a zone contains two or more zone players, such as the two zone players **106** and **108** in the family room, then the two zone players **106** and **108** can be configured to play the same audio source in synchrony, or the two zone players **106** and **108** can be paired to play two separate sounds in left and right channels, for example. In other words, the stereo effects of a sound can be reproduced or enhanced through the two zone players **106** and **108**, one for the left sound and the other for the right sound. In certain embodiments, paired zone players can play audio in synchrony with other zone players.

In certain embodiments, three or more zone players can be configured to play various channels of audio that is encoded with three channels or more sound. For example, the home theater room shows zone players **116**, **118**, and **120**. If the sound is encoded as 2.1 channel audio, then the zone player **116** can be configured to play left channel audio, the zone player **118** can be configured to play right channel audio, and the zone player **120** can be configured to play bass frequencies. Other configurations are possible and depend on the number of zone players and the type of audio. Further, a particular zone can be configured to play a 5.1 channel audio in one instance, such as when playing audio from a movie, and then dynamically switch to play stereo, such as when playing audio from a two channel source.

In certain embodiments, two or more zone players can be sonically consolidated to form a single, consolidated zone player. A consolidated zone player (though made up of multiple, separate devices) can be configured to process and reproduce sound differently than an unconsolidated zone player or zone players that are paired, because a consolidated zone player will have additional speaker drivers from which sound can be passed. The consolidated zone player can further be paired with a single zone player or yet another consolidated zone player. Each playback device of a consolidated playback device is preferably set in a consolidated mode.

According to some embodiments, one can continue to do any of: group, consolidate, and pair zone players, for example, until a desired configuration is complete. The actions of grouping, consolidation, and pairing are preferably performed through a control interface, such as using controller **130**, and not by physically connecting and re-connecting speaker wire, for example, to individual, discrete speakers to create different configurations. As such, certain embodiments described herein provide a more flexible and dynamic platform through which sound reproduction can be offered to the end-user.

Sources of audio content to be played by zone players **102-124** are numerous. Music from a personal library stored on a computer or networked-attached storage (NAS) can be accessed via the data network **128** and played. Internet radio stations, shows, and podcasts can be accessed via the data network **128**. Music services that let a user stream and download music and audio content can be accessed via the

data network **128**. Further, music can be obtained from traditional sources, such as a turntable or CD player, via a line-in connection to a zone player, for example. Audio content can also be accessed through AirPlay™ wireless technology by Apple, Inc., for example. Audio content received from one or more sources can be shared amongst the zone players **102** to **124** via the data network **128** and/or the controller **130**. The above-disclosed sources of audio content are referred to herein as network-based audio information sources. However, network-based audio information sources are not limited thereto.

The example home theater zone players **116**, **118**, **120** are coupled to an audio information source such as a television **132**. In some examples, the television **132** is used as a source of audio for the home theater zone players **116**, **118**, **120**, while in other examples audio information from the television **132** can be shared with any of the zone players **102-124** in the audio system **100**.

III. Example Playback Device

Referring now to FIG. **4**, there is shown an example functional block diagram of a zone player **400** in accordance with an embodiment. The zone player **400** of FIG. **4** includes a network interface **402**, a processor **408**, a memory **410**, an audio processing component **412**, a module **414**, an audio amplifier **416**, and a speaker unit **418** coupled to the audio amplifier **416**. FIG. **2A** shows an example illustration of such a zone player. Other types of zone players can not include the speaker unit **418** (e.g., such as shown in FIG. **2B**) or the audio amplifier **416** (e.g., such as shown in FIG. **2C**). Further, it is contemplated that the zone player **400** can be integrated into another component. For example, the zone player **400** could be constructed as part of a lamp for indoor or outdoor use.

Referring back to FIG. **4**, the network interface **402** facilitates a data flow between zone players and other devices on a data network (e.g., the data network **128** of FIG. **1**) and the zone player **400**. In some embodiments, the network interface **402** can manage the assembling of an audio source or file into smaller packets that are to be transmitted over the data network or reassembles received packets into the original source or file. In some embodiments, the network interface **402** can further handle the address part of each packet so that it gets to the right destination or intercepts packets destined for the zone player **400**. Accordingly, in certain embodiments, each of the packets includes an Internet Protocol (IP)-based source address as well as an IP-based destination address.

In some embodiments, the network interface **402** can include one or both of a wireless interface **404** and a wired interface **406**. The wireless interface **404**, also referred to as an RF interface, provides network interface functions for the zone player **400** to wirelessly communicate with other devices (e.g., other zone player(s), speaker(s), receiver(s), component(s) associated with the data network **128**, and so on) in accordance with a communication protocol (e.g., any of the wireless standards IEEE 802.11a, 802.11b, 802.11g, 802.11n, or 802.15). To receive wireless signals and to provide the wireless signals to the wireless interface **404** and to transmit wireless signals, the zone player **400** of FIG. **4** includes one or more antennas **420**. The wired interface **406** provides network interface functions for the zone player **400** to communicate over a wire with other devices in accordance with a communication protocol (e.g., IEEE 802.3). In some embodiments, a zone player includes both of the

interfaces **404** and **406**. In some embodiments, a zone player **400** includes only the wireless interface **404** or the wired interface **406**.

In some embodiments, the processor **408** is a clock-driven electronic device that is configured to process input data according to instructions stored in memory **410**. The memory **410** is data storage that can be loaded with one or more software modules **414**, which can be executed by the processor **408** to achieve certain tasks. In the illustrated embodiment, the memory **410** is a tangible machine readable medium storing instructions that can be executed by the processor **408**. In some embodiments, a task might be for the zone player **400** to retrieve audio data from another zone player or a device on a network. In some embodiments, a task might be for the zone player **400** to send audio data to another zone player or device on a network. In some embodiments, a task might be for the zone player **400** to synchronize playback of audio with one or more additional zone players. In some embodiments, a task might be to pair the zone player **400** with one or more zone players to create a multi-channel audio environment. Additional or alternative tasks can be achieved via the one or more software modules **414** and the processor **408**.

The audio processing component **412** can include one or more digital-to-analog converters (DAC), an audio preprocessing component, an audio enhancement component or a digital signal processor, and so on. In certain embodiments, the audio that is retrieved via the network interface **402** is processed and/or intentionally altered by the audio processing component **412**. Further, the audio processing component **412** can produce analog audio signals. The processed analog audio signals are then provided to the audio amplifier **416** for play back through speakers **418**. In addition, the audio processing component **412** can include necessary circuitry to process analog or digital signals as inputs to play from zone player **400**, send to another zone player on a network, or both play and send to another zone player on the network. An example input includes a line-in connection (e.g., an auto-detecting 3.5 mm audio line-in connection). The audio amplifier **416** is a device that amplifies audio signals to a level for driving one or more speakers **418**. The one or more speakers **418** can include an individual transducer (e.g., a “driver”) or a complete speaker system that includes an enclosure including one or more drivers. A particular driver can be a subwoofer (for low frequencies), a mid-range driver (middle frequencies), and a tweeter (high frequencies), for example. An enclosure can be sealed or ported, for example.

A zone player **400** can also be referred to herein as a playback device. An example playback device includes a Sonos® Play:5, which is manufactured by Sonos, Inc. of Santa Barbara, Calif. The Play:5 is an example zone player with a built-in amplifier and speakers. In particular, the Play:5 is a five-driver speaker system that includes two tweeters, two mid-range drivers, and one subwoofer. When playing audio content via the Play:5, the left audio data of a track is sent out of the left tweeter and left mid-range driver, the right audio data of a track is sent out of the right tweeter and the right mid-range driver, and mono bass is sent out of the subwoofer. Further, both mid-range drivers and both tweeters have the same equalization (or substantially the same equalization). That is, they are both sent the same frequencies, just from different channels of audio. Audio from Internet radio stations, online music and video services, downloaded music, analog audio inputs, television, DVD, and so on, can be played from a Sonos® Play:5. While the Play:5 is an example of a zone player with

speakers, it is understood that a zone player with speakers is not limited to one with a certain number of speakers (e.g., five speakers as in the Play:5), but rather can contain one or more speakers. Further, a zone player can be part of another device, which might even serve a purpose different than audio (e.g., a lamp).

IV. Example Controller

Referring now to FIG. 5, there is shown an example controller 500, which can correspond to the controlling device 130 in FIG. 1. The controller 500 can be used to facilitate the control of multi-media applications, automation and others in a system. In particular, the controller 500 is configured to facilitate a selection of a plurality of audio sources available on the network and enable control of one or more zone players (e.g., the zone players 102-124 in FIG. 1) through a wireless network interface 508. According to one embodiment, the wireless communications is based on an industry standard (e.g., infrared, radio, wireless standards IEEE 802.11a, 802.11b, 802.11g, 802.11n, or 802.15). Further, when a particular audio is being accessed via the controller 500 or being played via a zone player, a picture (e.g., album art) or any other data, associated with the audio source can be transmitted from a zone player or other electronic device to the controller 500 for display.

The controller 500 is provided with a screen 502 and an input interface 514 that allows a user to interact with the controller 500, for example, to navigate a playlist of many multimedia items and to control operations of one or more zone players. The screen 502 on the controller 500 can be an LCD screen, for example. The screen 500 communicates with and is commanded by a screen driver 504 that is controlled by a microcontroller (e.g., a processor) 506. The memory 510 can be loaded with one or more application modules 512 that can be executed by the microcontroller 506 with or without a user input via the user interface 514 to achieve certain tasks. In some embodiments, an application module 512 is configured to facilitate grouping a number of selected zone players into a zone group and synchronizing the zone players for audio play back. In some embodiments, an application module 512 is configured to control the audio sounds (e.g., volume) of the zone players in a zone group. In operation, when the microcontroller 506 executes one or more of the application modules 512, the screen driver 504 generates control signals to drive the screen 502 to display an application specific user interface accordingly.

The controller 500 includes a network interface 508 that facilitates wireless communication with a zone player. In some embodiments, the commands such as volume control and audio playback synchronization are sent via the network interface 508. In some embodiments, a saved zone group configuration is transmitted between a zone player and a controller via the network interface 508. The controller 500 can control one or more zone players, such as 102-124 of FIG. 1. There can be more than one controller for a particular system. Further, a controller can be integrated into a zone player.

It should be noted that other network-enabled devices such as an iPhone®, iPad® or any other smart phone or network-enabled device (e.g., a networked computer such as a PC or Mac®) can also be used as a controller to interact or control zone players in a particular environment. In some embodiments, a software application or upgrade can be downloaded onto a network enabled device to perform the functions described herein.

In certain embodiments, a user can create a zone group including at least two zone players from the controller 500. The zone players in the zone group can play audio in a synchronized fashion, such that all of the zone players in the zone group play back an identical audio source or a list of identical audio sources in a synchronized manner such that no (or substantially no) audible delays or hiccups could be heard. Similarly, in some embodiments, when a user increases the audio volume of the group from the controller 500, the signals or data of increasing the audio volume for the group are sent to one of the zone players and causes other zone players in the group to be increased together in volume.

A user via the controller 500 can group zone players into a zone group by activating a "Link Zones" or "Add Zone" soft button, or de-grouping a zone group by activating an "Unlink Zones" or "Drop Zone" button. For example, one mechanism for 'joining' zone players together for audio play back is to link a number of zone players together to form a group. To link a number of zone players together, a user can manually link each zone player or room one after the other. For example, assume that there is a multi-zone system that includes the following zones: Bathroom, Bedroom, Den, Dining Room, Family Room, and Foyer.

In certain embodiments, a user can link any number of the six zone players, for example, by starting with a single zone and then manually linking each zone to that zone.

In certain embodiments, a set of zones can be dynamically linked together using a command to create a zone scene or theme (subsequent to first creating the zone scene). For instance, a "Morning" zone scene command can link the Bedroom, Office, and Kitchen zones together in one action. Without this single command, the user would need to manually and individually link each zone. The single command might include a mouse click, a double mouse click, a button press, a gesture, or some other programmed action. Other kinds of zone scenes can be programmed.

In certain embodiments, a zone scene can be triggered based on time (e.g., an alarm clock function). For instance, a zone scene can be set to apply at 8:00 am. The system can link appropriate zones automatically, set specific music to play, and then stop the music after a defined duration. Although any particular zone can be triggered to an "On" or "Off" state based on time, for example, a zone scene enables any zone(s) linked to the scene to play a predefined audio (e.g., a favorable song, a predefined playlist) at a specific time and/or for a specific duration. If, for any reason, the scheduled music failed to be played (e.g., an empty playlist, no connection to a share, failed Universal Plug and Play (UPnP), no Internet connection for an Internet Radio station, and so on), a backup buzzer can be programmed to sound. The buzzer can include a sound file that is stored in a zone player, for example.

V. Example Ad-Hoc Network

Certain particular examples will now be provided in connection with FIGS. 6-8B to describe, for purposes of illustration only, certain base systems and methods to provide and facilitate connection to a playback network. FIG. 6 shows that there are three zone players 602, 604 and 606 and a controller 608 that form a network branch that is also referred to as an Ad-Hoc network 610. The network 610 may be wireless, wired, or a combination of wired and wireless. In general, an Ad-Hoc (or "spontaneous") network is a local area network or other small network in which there is no one access point for all traffic. With an established Ad-Hoc network 610, the devices 602, 604, 606 and 608 can all

US 9,967,615 B2

11

communicate with each other in a “peer-to-peer” style of communication, for example. Furthermore, devices may come/and go from the network **610**, and the network **610** will automatically reconfigure itself without needing the user to reconfigure the network **610**.

Using the Ad-Hoc network **610**, the devices **602**, **604**, **606**, and **608** can share or exchange one or more audio sources and be grouped to play the same or different audio sources. For example, the devices **602** and **604** are grouped to playback one piece of music, and at the same time, the device **606** plays back another piece of music. In other words, the devices **602**, **604**, **606** and **608**, as shown in FIG. 6, form a HOUSEHOLD that distributes audio and/or reproduces sound. As used herein, the term HOUSEHOLD (provided in uppercase letters to disambiguate from the user’s domicile) is used to represent a collection of networked devices that are cooperating to provide an application or service. An instance of a HOUSEHOLD is identified with a household **10** (or household identifier).

In certain embodiments, a household identifier (HHID) is a short string or an identifier that is computer-generated to help ensure that it is unique. Accordingly, the network **610** can be characterized by a unique HHID and a unique set of configuration variables or parameters, such as channels (e.g., respective frequency bands), SSID (a sequence of alphanumeric characters as a name of a wireless network), and WEP keys (wired equivalent privacy or other security keys). In certain embodiments, SSID is set to be the same as HHID.

In certain embodiments, each HOUSEHOLD includes two types of network nodes: a control point (CP) and a zone player (ZP). The control point controls an overall network setup process and sequencing, including an automatic generation of required network parameters (e.g., WEP keys). In an embodiment, the CP also provides the user with a HOUSEHOLD configuration user interface. The CP function can be provided by a computer running a CP application module, or by a handheld controller (e.g., the controller **308**) also running a CP application module, for example. The zone player is any other device on the network that is placed to participate in the automatic configuration process. The ZP, as a notation used herein, includes the controller **308** or a computing device, for example.

In certain embodiments, configuration of a HOUSEHOLD involves multiple CPs and ZPs that rendezvous and establish a known configuration such that they can use a standard networking protocol (e.g., IP over Wired or Wireless Ethernet) for communication. In an embodiment, two types of networks/protocols are employed: Ethernet 802.3 and Wireless 802.11g. Interconnections between a CP and a ZP can use either of the networks/protocols. A device in the system as a member of a HOUSEHOLD can connect to both networks simultaneously. In an environment that has both networks in use, it is assumed that at least one device in a system is connected to both as a bridging device, thus providing bridging services between wired/wireless networks for others. The zone player **606** in FIG. 6 is shown to be connected to both networks, for example. The connectivity to the network **612** is based on Ethernet while the connectivity to other devices **602**, **604** and **608** is based on Wireless. It is understood, however, that in some embodiments each zone player **606**, **604**, **602** may access the Internet when retrieving media from the cloud (e.g., Internet) via the bridging device. For example, zone player **602** may contain a uniform resource locator (URL) that specifies an address to a particular audio track in the cloud. Using the

12

URL, the zone player **602** may retrieve the audio track from the cloud, and ultimately play the audio out of one or more zone players.

VI. Example Music Sharing and Playback Configuration

Certain embodiments enable a user to stream music from a music-playing application (e.g., browser-based application, native music player, other multimedia application, and so on) to a local multimedia content playback (e.g., Sonos™) system. Certain embodiments provide secure systems and methods for multimedia content playback across a plurality of systems and locations. Certain embodiments facilitate integration between content partners and a playback system as well as supporting maintenance of such content and system.

FIG. 7 shows a system including a plurality of networks including a cloud-based network and at least one local playback network. The network includes a plurality of playback devices or players, though it is understood that the network may contain only one playback device. In certain embodiments, each player has an ability to retrieve its content for playback. Control and content retrieval can be distributed or centralized, for example. Input can include streaming content provider input, third party application input, mobile device input, user input, and/or other playback network input into the cloud for local distribution and playback.

As illustrated by the example system **700** of FIG. 7, a plurality of content providers **720-750** can be connected to one or more local playback networks **760-770** via a cloud and/or other network **710**. Using the cloud **710**, a multimedia playback system **720** (e.g., Sonos™), a mobile device **730**, a third party application **740**, a retail location **750**, and so on can provide multimedia content (requested or otherwise) to local playback networks **760**, **770**. Within each local network **760**, **770**, a controller **762**, **772** and/or playback device **764**, **774** can provide a song identifier, song name, playlist identifier, playlist name, genre, preference, and so on, and/or simply receive content from a connected system via the cloud.

For example, a user listens to a third party music application (e.g., Pandora™ Rhapsody™, Spotify™, and so on) on her smart phone while commuting. She’s enjoying the current channel and, as she walks in the door to her home, selects an option to continue playing that channel on her household music playback system (e.g., Sonos™). The playback system picks up from the same spot on the selected channel that was on her phone and outputs that content (e.g., that song) on speakers and/or other playback devices connected to the household playback system. A uniform resource indicator (URI) (e.g., a uniform resource locator (URL)) can be passed to a playback device to fetch content from a cloud and/or other networked source, for example. A playback device, such as a zone player, can fetch content on its own without use of a controller, for example. Once the zone player has a URL (or some other identification or address) for a song and/or playlist, the zone player can run on its own to fetch the content. Songs and/or other multimedia content can be retrieved from the Internet rather than a local device (e.g., a compact disc (CD)), for example. A third party application can open or utilize an application programming interface (API) to pass music to the household playback system without tight coupling to that household playback system.

US 9,967,615 B2

13

In another example of an application determining a playlist and/or other content for playback, a user enjoys listening to music on an online music service (e.g., turntable.fm or other virtual room that a user can enter to choose from a plurality of online disc jockeys (DJs) deciding what to play next) using his Mac Book Pro™ at home. He likes the unique user experience the service offers, and he frequently hops from room to room discovering new music. To maximize sound quality, he plays the music on his household playback system (e.g., Sonos™). A button or other indicator can be added to the turntable.fm Web application to switch the content being played to the playback system for output (e.g., to the Sonos™ system rather than or in addition to the Mac Book™). While Web-based applications typically do not have access to items on a local network, certain embodiments enable a third-party Web-based application (e.g., Turntable.fm) to talk to a playback system (e.g., Sonos™) in a certain way (e.g., may have to log in with a username and password), and the identified user has the website send audio or audio and video down to a playback device (e.g., a zone player) on the playback system local network to play music there (or some other media).

In another example, a first user creates a playlist (e.g., a Spotify™ playlist). The first user visits a second user's house, pulls out her smart phone and shares her playlist by playing it on the second user's household playback (e.g., Sonos™) system using her third party (e.g., Spotify™) application. The first user may also go to the third party content provider's (e.g., Spotify's™) website and share her playlist on the second user's playback system.

Thus, certain embodiments provide cross-service linking such that a song identifier can be passed from one user and/or service to another to be fetched and played. A user having a playlist on his or her phone can visit a friend and, using her account on her friend's system, play a song to which she has an access right. A retrieved song can be streamed locally to a user's phone, or an application can pass a song identifier to a local playback system which looks up the song identifier and finds an available audio stream to which the user has a right to play and then plays that song.

In another example, a user is staying in a hotel room or other facility including a local playback network. For example, a speaker and/or other playback device (e.g., a Sonos™ Play:3, Play: 5 and so on) in a hotel room can be utilized to play multimedia content to which the user has access from his or her playback network account, streaming audio source, third party application, and so on. Content can be output to one or more devices based on availability, access, configuration, priority, preference, and so on. In certain embodiments, a playback network includes a plurality of nodes, and each node has a capability to play sound in response to an input. Requested output is provided to a most logical connection, for example.

In certain embodiments, a phone device, a television device, and so on can be used to play music, audio, video and/or other multimedia content. In an example, a push button on a microphone or household intercom system to tell the kids dinner is ready is provided over the local playback network.

FIG. 8 shows a flow diagram for a method 800 to provide audio content to a local playback system. In the example method 800 of FIG. 8, a third party application acts as a "virtual line-in" to the local playback system. At block 810, streaming of music or other content from a third party application to a local content playback system is triggered. For example, a "Play to Sonos" button is pressed on a Rhapsody™ application. At block 820, content is streamed

14

to one or more components in a household playback network. The music may be streamed to predetermined zones or players in a household, for example. The music may be further directed to be played in different zones or players throughout the household. Playback on the local network can be facilitated to one or more zones/players based on a configuration (e.g., a zone scene, theme, and so on). Thus, certain embodiments allow a large degree of flexibility in where the music is actually played. For example, the music can be played in the kitchen, the family room, the patio, and so on. Further, the music may be redirected to different zones.

At block 830, the incoming content (e.g., audio) stream is provided directly from a third party application or other external source to the local playback network for playback. For example, rather than passing track identifiers, an audio stream is provided to a Sonos household system for playback to one or more configured zones. At block 840, the local playback system consumes the stream and plays it as it would other content on the local playback (e.g., Sonos™) network (e.g., via zones and so on). At block 850, a playback device (e.g., a zone player, Play:3™, Play:5™, and so on) adds timing information to the streaming content signal (e.g., the device takes the streaming audio signal and repackages it for local synchronized playback). In some embodiments, timing information is not added to the signal unless two or more playback devices are configured to play the audio in synchrony.

FIG. 9 shows a flow diagram for a method 900 to provide audio content to a local playback system. In the example method 900 of FIG. 9, a uniform resource indicator (URI) handler approach is provided for content output. At block 910, a link or other reference is embedded in a third party application (e.g., Facebook™ or Twitter). At block 920, when the link is selected (e.g., clicked), a local playback (e.g., Sonos™) controller, if available, is launched. At block 930, the application (e.g., accessed on a phone, tablet, computer, and so on) passes a URI for associated content (e.g., an audio track and so on) to a local playback system (e.g., Sonos™) controller. At block 940, the local controller outputs the associated content (e.g., plays the music) via the URI. For example, music is streamed from the cloud to one or more playback devices on the local playback network.

In certain embodiments, an application associated with the operating system can register to handle all URIs (URLs) that start with a certain prefix and can define how data is encoded into those URLs so a local playback system application can generate a link (e.g., "sonos:") and put that link into a message (e.g., email, text message, instant message (IM), etc.). The local playback application registered to handle such URLs can parse the URLs to determine what song, playlist, streaming radio station, etc., to play. This launches the controller application. For example, if a first listener likes a song and tweets that song, Twitter™ can include a clickable link which launches a playback application and starts the music playing on a local playback system if the local system can find the song (e.g., if have the application, if have rights/access to the song, etc.). In certain embodiments, the system knows to trigger the receiving user's system rather than the sending user's system to play associated content based on the transmitted link/identifier.

For example, an application can register with the system to handle all URLs that start with a custom prefix (e.g., an HTTP "scheme"). For instance, Sonos controller apps can register to handle any URL that begins with "sonos:" or "x-sonos:". In certain embodiments, a playback system provider can define and publish the format of its URLs so

15

that any third party application can create a link or reference to content. A large amount of data can be encoded into a URL using query parameters, for example.

In an example, when an application tries to “open” or “browse” to a URL, the system checks to see if the scheme of the URL matches the “sonos:” scheme that has been registered with the application. If a URL handler application is found, the system launches that application (e.g., the application can but does not need to be running in the background) and passes the URL to the application. The application then parses the URL and executes functionality based on the data in the URL. For example, the URL can contain the name of a music service and a playlist identifier from that service, plus the name of a Sonos™ Zone Player, causing the Sonos controller to start that playlist playing on that zone.

FIG. 10 shows a flow diagram for a method 1000 to provide audio content to a local playback system. In the example method 1000 of FIG. 10, at block 1010, a link or other reference is embedded in a third party application (e.g., Facebook™). At block 1020, when the link is selected, a playback system (e.g., Sonos™) server is contacted and provided with information regarding selected content for playback. For example, rather than launching a local controller application, a server is contacted regarding music for playback on a local network. At block 1030, using the provided information, the server identifies and provides the content locally on a user’s local playback system. For example, the server can then start playing the music directly on the user’s Sonos™ system (e.g., without going through a Sonos™ controller application).

In certain embodiments, a “single sign-on” technology is provided so that the user does not need to re-enter a username and password in order to authenticate to the playback server. Example single sign-on technologies include Facebook Connect™, Windows Live ID™, etc.

In certain embodiments, instead of using a specialized link, such as a “sonos:” link, a normal URL can be used to point to a playback system (e.g., Sonos™) webserver, which generates links with special data embedded in the link. A playback system is identified, and content identified by the URL can be playing at via the local playback network (e.g., mesh network configured for home, hotel room, etc.). Parameters such as authentication, security, location, and so on can be configured for local playback of remote content.

FIG. 11 shows a flow diagram for a method 1100 to provide audio content to a local playback system. The example method 1100 of FIG. 11 provides a “throw it over the wall” approach to content delivery to a local playback system. At block 1110, a third party application provides a multimedia playback device (e.g., a Sonos™ zone player (ZP)) with enough information about content (e.g., an audio track) so that, at block 1120, the local playback system (e.g., SonosNet™) can directly access a source of the content and, at block 1130, play the content directly off the network (e.g., the Internet) or cloud.

In certain embodiments, a local playback controller application is not involved. Information passed over to the local playback device may include an identifier for a single track, a playlist, a streaming radio station, a programmed radio station, and so on. This information can also include a current play position within a list to enable near-seamless “handoff” of music from a portable device to a local playback system. Once the music information is handed from the third-party application to the local playback system, there is no further synchronization between the two systems.

16

A connection between the third-party application and the local playback device (e.g., Sonos ZonePlayer™) can be direct over a local area network (LAN), remote through a proxy server in the cloud, and so on. A LAN delivery approach may be easier to integrate into “native” applications (e.g., applications written for iOS or Android), and a proxy server approach may be easier for third party applications that are browser-based, for example.

In certain embodiments, information is provided from a third party application to a local playback system without being routed through or by a controller application. Here, the third party application is communicating with the multimedia playback device (e.g., a Sonos ZonePlayer™). Information can be passed locally, rather than through the Internet, for example. The local playback device accesses the Internet to find content to stream, and the third party application takes the place of the controller application (e.g., throw it over the wall—the application passes information and the local playback system runs it).

Certain embodiments provide an approach similar to the “throw it over the wall” or one way communication approach of FIG. 11 except that the third party application not only tells the local playback system what to play, but also maintains two-way communication with the local playback (e.g., Sonos™) system. Two-way communication helps enable features such as keeping a local playback queue synchronized with a queue that the user is editing/managing in the third party application; allow the third party application to know what is currently playing on the local playback system; allow integrated transport control between the third party application and the local playback system; and so on.

In certain embodiments, a local playback system can pass information back to a third party application to indicate a current point of playback (e.g., now playing a third song in a playlist, fourth song in the playlist, and so on). The local playback system can pass parameter information, such as a change in volume, from a local multimedia playback device to the third party application so the application can reflect the change in volume to the user via its graphical user interface. The third party application can instruct the local playback system to skip a song, go to a certain location, and so on.

Certain embodiments provide a third party mode that allows users to select from any local playback network (e.g., Sonos™) controller to listen to audio from one or more third party applications on their smartphones or tablets (e.g., Android™ devices). For example, a user may be using a local playback network controller application and now wants a third party application to appear as an audio source within the controller application. The user can then select the controller application that he or she wishes to play audio from the third party application, for example.

Certain embodiments provide queue management to allow a third party application to control a local playback queue. That is, the local playback system has a queue, but the third party application allows users to add, delete and so on from the queue, for example. Rather than switch from content that the user is currently playing, the local playback system allows a user to create a playlist on the fly. For example, if last.fm users vote that they do not like a song and it should be skipped, then the local playback system will skip it.

Certain embodiments allow a third party application to override a local playback queue with its own application-specific queue. The local playback system periodically fetches a short list of tracks to play next. The list of tracks to play is determined by the third-party application, for

US 9,967,615 B2

17

example. In certain embodiments, a shared queue is provided between the local playback system and the third party application to keep the local system and application synchronized.

Certain embodiments allow control of playback system functions and/or settings via an external (e.g., third party) application. For example, a local playback system can allow volume control, play/pause, and so on and can interact with an application running on a given platform/operating system (OS). Certain embodiments provide a Web API that can be used to access functionality.

Certain embodiments facilitate control of a local playback system from outside a household or other location at which the local playback network is configured. For example, a user can queue up music while away from his or her house. The application can facilitate setup and/or configuration. For example, a third party application may ask the user to enter a Sonos customer email address and password. The application can then make a request to a Sonos server in the cloud to determine the zone groups on which music can be played.

Various inventions have been described in sufficient detail with a certain degree of particularity. It is understood to those skilled in the art that the present disclosure of embodiments has been made by way of examples only and that numerous changes in the arrangement and combination of parts can be resorted without departing from the spirit and scope of the present disclosure as claimed. While the embodiments discussed herein can appear to include some limitations as to the presentation of the information units, in terms of the format and arrangement, the embodiments have applicability well beyond such embodiment, which can be appreciated by those skilled in the art. Accordingly, the scope of the present disclosure is defined by the appended claims rather than the foregoing description of embodiments.

The invention claimed is:

1. A method comprising:

causing, via a control device, a graphical interface to display a control interface including one or more transport controls to control playback by the control device; after connecting to a local area network via a network interface, identifying, via the control device, playback devices connected to the local area network;

causing, via the control device, the graphical interface to display a selectable option for transferring playback from the control device;

detecting, via the control device, a set of inputs to transfer playback from the control device to a particular playback device, wherein the set of inputs comprises: (i) a selection of the selectable option for transferring playback from the control device and (ii) a selection of the particular playback device from the identified playback devices connected to the local area network;

after detecting the set of inputs to transfer playback from the control device to the particular playback device, causing playback to be transferred from the control device to the particular playback device, wherein transferring playback from the control device to the particular playback device comprises:

(a) causing one or more first cloud servers to add multimedia content to a local playback queue on the particular playback device, wherein adding the multimedia content to the local playback queue comprises the one or more first cloud servers adding, to the local playback queue, one or more resource locators corresponding to respective locations of the multimedia content at one or more second cloud servers of a streaming content service;

18

(b) causing playback at the control device to be stopped; and

(c) modifying the one or more transport controls of the control interface to control playback by the playback device; and

causing the particular playback device to play back the multimedia content, wherein the particular playback device playing back the multimedia content comprises the particular playback device retrieving the multimedia content from one or more second cloud servers of a streaming content service and playing back the retrieved multimedia content.

2. The method of claim 1, wherein detecting the set of inputs to transfer playback from the control device to the particular playback device comprises detecting a set of inputs to transfer playback from the control device to a particular zone of a media playback system that includes the particular playback device as a first channel of a stereo pair and an additional playback device as a second channel of the stereo pair, wherein modifying the one or more transport controls of the control interface to control playback by the particular playback device comprises causing the one or more transport controls of the control interface to control playback by the particular playback device and the additional playback device, and wherein the particular playback device playing back the retrieved multimedia content comprises the particular playback device and the additional playback device playing back the multimedia content as the stereo pair.

3. The method of claim 1, wherein detecting the set of inputs to transfer playback from the control device to the particular playback device comprises detecting a set of inputs to transfer playback from the control device to a particular zone group of a media particular playback system that includes a first zone and a second zone, wherein the first zone includes the particular playback device and the second zone includes at least one additional playback device, wherein modifying the one or more transport controls of the control interface to control playback by the playback device comprises causing the one or more transport controls of the control interface to control playback by the particular playback device and the at least one additional playback device in synchrony, and wherein the particular playback device playing back the retrieved multimedia content comprises the particular playback device and the at least one additional playback device playing back the multimedia content in synchrony.

4. The method of claim 1, wherein the control interface is displayed by an application associated with the streaming content service, and wherein the set of inputs further comprises detecting an input to select a link in the application associated with the streaming content service and wherein selection of the link launches a second application to facilitate retrieving the multimedia content by the particular playback device from a particular source indicated by a resource locator.

5. The method of claim 1, wherein the control interface is displayed by an application associated with the streaming content service, and wherein the set of inputs further comprises detecting an input to select a link in the application associated with the streaming content service and wherein selection of the link causes the control device to transmit information to the one or more first cloud servers to add multimedia content to the local playback queue on the particular playback device.

6. The method of claim 1, further comprising detecting, via the control device, a set of inputs to transfer playback

US 9,967,615 B2

19

from the playback device back to the control device, wherein transferring playback from the playback device back to the control device comprises:

causing playback at the playback device to be stopped; and

modifying the one or more transport controls of the control interface to control playback by the control device.

7. The method of claim 1, wherein causing the graphical interface to display the control interface including one or more transport controls to control playback by the control device comprises causing the graphical interface to display a control interface that includes the one or more transport controls in a particular arrangement on the graphical interface, and wherein modifying the one or more transport controls of the control interface to control playback by the particular playback device comprises causing the graphical interface to display the one or more transport controls to control playback by the particular playback device in the particular arrangement.

8. The method of claim 1, wherein causing the one or more first cloud servers to add multimedia content to the local playback queue comprises causing an identifier of the multimedia content to be added to the local playback queue, wherein the identifier indicates a particular source of the multimedia content at the one or more second cloud servers of the streaming content service, wherein the particular playback device receives the multimedia content from the particular source at the one or more second cloud servers of the streaming content service.

9. The method of claim 1, wherein causing one or more first cloud servers to add the multimedia content to the local playback queue on the particular playback device comprises sending a message to the streaming content service that causes the one or more first cloud servers to add the multimedia content to the local playback queue on the particular playback device.

10. The method of claim 1, wherein detecting the set of inputs comprises detecting a selection of the multimedia content.

11. The method of claim 1, wherein detecting the set of inputs comprises detecting an input that causes playback at the control device to be stopped.

12. The method of claim 1, wherein detecting the set of inputs comprises detecting selection of a button on the control interface.

13. A tangible, non-transitory computer readable storage medium including instructions for execution by a processor, the instructions, when executed, cause a control device to implement a method comprising:

causing a graphical interface to display a control interface including one or more transport controls to control playback by the control device;

after connecting to a local area network via a network interface, identifying playback devices connected to the local area network;

causing the graphical interface to display a selectable option for transferring playback from the control device;

detecting a set of inputs to transfer playback from the control device to a particular playback device, wherein the set of inputs comprises: (i) a selection of the selectable option for transferring playback from the control device and (ii) a selection of the particular playback device from the identified playback devices connected to the local area network;

20

after detecting the set of inputs to transfer playback from the control device to the particular playback device, causing playback to be transferred from the control device to the particular playback device, wherein transferring playback from the control device to the particular playback device comprises:

(a) causing one or more first cloud servers to add multimedia content to a local playback queue on the particular playback device, wherein adding the multimedia content to the local playback queue comprises the one or more first cloud servers adding, to the local playback queue, one or more resource locators corresponding to respective locations of the multimedia content at one or more second cloud servers of a streaming content service;

(b) causing playback at the control device to be stopped; and

(c) modifying the one or more transport controls of the control interface to control playback by the playback device; and

causing the particular playback device to play back the multimedia content, wherein the particular playback device playing back the multimedia content comprises the particular playback device retrieving the multimedia content from one or more second cloud servers of a streaming content service and playing back the retrieved multimedia content.

14. The tangible, non-transitory computer readable medium of claim 13, wherein detecting the set of inputs to transfer playback from the control device to the particular playback device comprises detecting a set of inputs to transfer playback from the control device to a particular zone of a media playback system that includes the particular playback device as a first channel of a stereo pair and an additional playback device as a second channel of the stereo pair, wherein modifying the one or more transport controls of the control interface to control playback by the particular playback device comprises causing the one or more transport controls of the control interface to control playback by the particular playback device and the additional playback device, and wherein the particular playback device playing back the retrieved multimedia content comprises the particular playback device and the additional playback device playing back the multimedia content as the stereo pair.

15. The tangible, non-transitory computer readable medium of claim 13, wherein detecting the set of inputs to transfer playback from the control device to the particular playback device comprises detecting a set of inputs to transfer playback from the control device to a particular zone group of a media particular playback system that includes a first zone and a second zone, wherein the first zone includes the particular playback device and the second zone includes at least one additional playback device, wherein modifying the one or more transport controls of the control interface to control playback by the playback device comprises causing the one or more transport controls of the control interface to control playback by the particular playback device and the at least one additional playback device in synchrony, and wherein the particular playback device playing back the retrieved multimedia content comprises the particular playback device and the at least one additional playback device playing back the multimedia content in synchrony.

16. The tangible, non-transitory computer readable medium of claim 13, wherein the control interface is displayed by an application associated with the streaming content service, and wherein the set of inputs further com-

US 9,967,615 B2

21

prises detecting an input to select a link in the application associated with the streaming content service and wherein selection of the link launches a second application to facilitate retrieving the multimedia content by the particular playback device from a particular source indicated by a resource locator.

17. The tangible, non-transitory computer readable medium of claim 13, wherein the control interface is displayed by an application associated with the streaming content service, and wherein the set of inputs further comprises detecting an input to select a link in the application associated with the streaming content service and wherein selection of the link causes the control device to transmit information to the one or more first cloud servers to add multimedia content to the local playback queue on the particular playback device.

18. The tangible, non-transitory computer readable medium of claim 13, wherein the method further comprises detecting a set of inputs to transfer playback from the playback device back to the control device, wherein transferring playback from the playback device back to the control device comprises:

causing playback at the playback device to be stopped; and

modifying the one or more transport controls of the control interface to control playback by the control device.

19. The tangible, non-transitory computer readable medium of claim 13, wherein causing the graphical interface to display the control interface including one or more transport controls to control playback by the control device comprises causing the graphical interface to display a control interface that includes the one or more transport controls in a particular arrangement on the graphical interface, and wherein modifying the one or more transport controls of the control interface to control playback by the playback device comprises causing the graphical interface to display the one or more transport controls to control playback by the playback device in the particular arrangement.

20. The tangible, non-transitory computer readable medium of claim 13, wherein causing the one or more first cloud servers to add multimedia content to the local playback queue on the particular playback device comprises causing an identifier of the multimedia content to be added to the local playback queue, wherein the identifier indicates a particular source of the multimedia content at the one or more second cloud servers of the streaming content service, wherein the particular playback device receives the multimedia content from the particular source at the one or more second cloud servers of the streaming content service.

21. The tangible, non-transitory computer readable medium of claim 13, wherein causing one or more first cloud servers to add the multimedia content to the local playback queue on the particular playback device comprises sending a message to the streaming content service that causes the one or more first cloud servers to add the multimedia content to the local playback queue on the particular playback device.

22. The tangible, non-transitory computer readable medium of claim 13, wherein detecting the set of inputs comprises detecting a selection of the multimedia content.

23. The tangible, non-transitory computer readable medium of claim 13, wherein detecting the set of inputs comprises detecting an input that causes playback at the control device to be stopped.

22

24. The tangible, non-transitory computer readable medium of claim 13, wherein detecting the set of inputs comprises detecting selection of a button on the control interface.

25. A control device comprising:

a graphical interface;

a wireless communication interface to communicate with a playback device;

one or more processors;

tangible non-transitory computer-readable media having instructions encoded therein, wherein the instructions, when executed by the one or more processors, cause the control device to perform functions comprising:

causing the graphical interface to display a control interface including one or more transport controls to control playback by the control device;

after connecting to a local area network via the wireless communication interface, identifying playback devices connected to the local area network;

causing the graphical interface to display a selectable option for transferring playback from the control device;

detecting a set of inputs to transfer playback from the control device to a particular playback device, wherein the set of inputs comprises: (i) a selection of the selectable option for transferring playback from the control device and (ii) a selection of the particular playback device from the identified playback devices connected to the local area network;

after detecting the set of inputs to transfer playback from the control device to the particular playback device, causing playback to be transferred from the control device to the particular playback device, wherein transferring playback from the control device to the particular playback device comprises:

(a) causing one or more first cloud servers to add multimedia content to a local playback queue on the particular playback device, wherein adding the multimedia content to the local playback queue comprises the one or more first cloud servers adding, to the local playback queue, one or more resource locators corresponding to respective locations of the multimedia content at one or more second cloud servers of a streaming content service;

(b) causing playback at the control device to be stopped; and

(c) modifying the one or more transport controls of the control interface to control playback by the playback device; and

causing the particular playback device to play back the multimedia content, wherein the particular playback device playing back the multimedia content comprises the particular playback device retrieving the multimedia content from one or more second cloud servers of a streaming content service and playing back the retrieved multimedia content.

26. The control device of claim 25, wherein detecting the set of inputs to transfer playback from the control device to the particular playback device comprises detecting a set of inputs to transfer playback from the control device to a particular zone group of a media particular playback system that includes a first zone and a second zone, wherein the first zone includes the particular playback device and the second zone includes at least one additional playback device, wherein modifying the one or more transport controls of the

US 9,967,615 B2

23

control interface to control playback by the playback device comprises causing the one or more transport controls of the control interface to control playback by the particular playback device and the at least one additional playback device in synchrony, and wherein the particular playback device 5 playing back the retrieved multimedia content comprises the particular playback device and the at least one additional playback device playing back the multimedia content in synchrony.

27. The control device of claim 25, wherein detecting the 10 set of inputs comprises detecting a selection of the multimedia content.

28. The control device of claim 25, wherein detecting the set of inputs comprises detecting an input that causes 15 playback at the control device to be stopped.

29. The control device of claim 25, wherein detecting the set of inputs comprises detecting selection of a button on the control interface.

* * * * *

24

EXHIBIT 2

(12) **United States Patent**
Coburn, IV et al.

(10) **Patent No.:** **US 10,779,033 B2**

(45) **Date of Patent:** **Sep. 15, 2020**

(54) **SYSTEMS AND METHODS FOR
NETWORKED MUSIC PLAYBACK**

(56) **References Cited**

U.S. PATENT DOCUMENTS

(71) Applicant: **SONOS, INC.**, Santa Barbara, CA (US)

5,406,634 A 4/1995 Anderson et al.

(72) Inventors: **Arthur Coburn, IV**, Lexington, MA
(US); **Joni Rafalski Hoadley**, Santa
Barbara, CA (US)

5,440,644 A 8/1995 Farinelli et al.

(Continued)

FOREIGN PATENT DOCUMENTS

(73) Assignee: **Sonos, Inc.**, Santa Barbara, CA (US)

CA 2832542 A1 10/2012

CA 2947275 A1 10/2012

(Continued)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

OTHER PUBLICATIONS

(21) Appl. No.: **16/389,906**

Chinese Patent Office, Second Office Action dated Nov. 13, 2018,
issued in connection with Chinese Application No. 201480042472.
1, 7 pages.

(22) Filed: **Apr. 19, 2019**

(Continued)

(65) **Prior Publication Data**

US 2019/0332349 A1 Oct. 31, 2019

Primary Examiner — Jesse A Elbin

Related U.S. Application Data

(57) **ABSTRACT**

(63) Continuation of application No. 15/872,500, filed on
Jan. 16, 2018, now Pat. No. 10,567,831, which is a
(Continued)

An example computing device in a first mode is configured
for playback of given audio content. While in the first mode,
the computing device displays a representation of one or
more playback devices in a media playback system that are
available to accept playback responsibility for the given
audio content and receives user input indicating a selection
of a given playback device. The computing device transmits
an instruction for playback responsibility to be transferred to
the given playback device such that i) an identifier of the
given audio content and a playback position for the given
audio content are provided to the given playback device and
ii) the given playback device becomes configured for play-
back of the given audio content. The computing device
transitions from the first mode to a second mode in which the
computing device is configured to control the given play-
back device's playback of the given audio content.

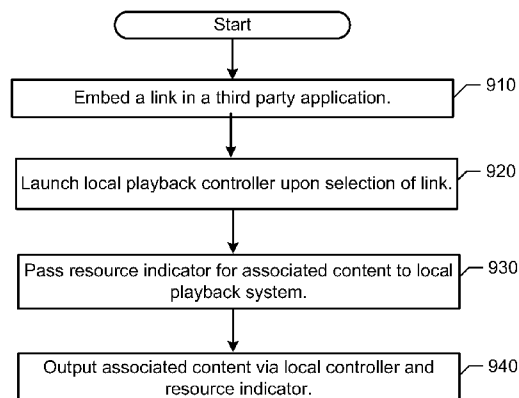
(51) **Int. Cl.**
H04N 21/436 (2011.01)
H04N 21/472 (2011.01)
(Continued)

(52) **U.S. Cl.**
CPC **H04N 21/43615** (2013.01); **G06F 3/0481**
(2013.01); **G06F 3/04842** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC H04R 3/12; H04R 27/00; H04R 2227/003;
H04R 2227/005; H04R 2420/07;
(Continued)

16 Claims, 11 Drawing Sheets

900 ↘



US 10,779,033 B2

Page 2

Related U.S. Application Data

continuation of application No. 14/520,578, filed on Oct. 22, 2014, now Pat. No. 9,883,234, which is a continuation of application No. 13/341,237, filed on Dec. 30, 2011, now Pat. No. 9,654,821.

(51) Int. Cl.

H04N 21/485 (2011.01)
H04N 21/81 (2011.01)
H04N 21/658 (2011.01)
G06F 3/0481 (2013.01)
G06F 3/0484 (2013.01)
G06F 3/16 (2006.01)
G11B 19/02 (2006.01)
H04L 29/06 (2006.01)
H04R 3/12 (2006.01)
H04N 21/439 (2011.01)
H04N 21/61 (2011.01)
H04N 21/643 (2011.01)
H04N 21/6587 (2011.01)
H04N 21/43 (2011.01)
H04N 21/433 (2011.01)
H04N 21/858 (2011.01)

(52) U.S. Cl.

CPC *G06F 3/04847* (2013.01); *G06F 3/165* (2013.01); *G11B 19/025* (2013.01); *H04L 29/06027* (2013.01); *H04L 65/4084* (2013.01); *H04N 21/4307* (2013.01); *H04N 21/439* (2013.01); *H04N 21/4333* (2013.01); *H04N 21/47202* (2013.01); *H04N 21/4852* (2013.01); *H04N 21/6125* (2013.01); *H04N 21/64322* (2013.01); *H04N 21/6581* (2013.01); *H04N 21/6587* (2013.01); *H04N 21/8113* (2013.01); *H04N 21/8586* (2013.01); *H04R 3/12* (2013.01); *G06F 3/04817* (2013.01); *H04R 2227/005* (2013.01); *H04R 2420/07* (2013.01)

(58) Field of Classification Search

CPC *G06F 3/048*; *G06F 3/0481*; *G06F 3/04817*; *G06F 3/0484*; *G06F 3/08442*; *G06F 3/04247*; *G06F 3/165*; *H04L 29/06027*; *H04L 65/4084*; *G11B 19/025*
 USPC 700/94; 715/716, 727, 765, 771
 See application file for complete search history.

(56) References Cited

U.S. PATENT DOCUMENTS

5,642,171 A	6/1997	Baumgartner et al.	6,757,517 B2	6/2004	Chang et al.
5,761,320 A	6/1998	Farinelli et al.	6,778,869 B2	8/2004	Champion
5,856,827 A	1/1999	Sudo	6,826,283 B1	11/2004	Wheeler et al.
5,923,902 A	7/1999	Inagaki	6,832,293 B1	12/2004	Tagawa et al.
6,002,862 A	12/1999	Takaiki	6,910,078 B1	6/2005	Raman et al.
6,032,202 A	2/2000	Lea et al.	6,985,694 B1	1/2006	De Bonet et al.
6,119,239 A	9/2000	Fujii	7,017,118 B1	3/2006	Carroll
6,122,749 A	9/2000	Gulick	7,020,048 B2	3/2006	McComas
6,181,316 B1	1/2001	Little et al.	7,113,833 B1	9/2006	Brown et al.
6,255,961 B1	7/2001	Van Ryzin et al.	7,117,451 B2	10/2006	Sielken
6,256,554 B1	7/2001	DiLorenzo	7,130,608 B2	10/2006	Hollstrom et al.
6,404,811 B1	6/2002	Cvetko et al.	7,130,616 B2	10/2006	Janik
6,469,633 B1	10/2002	Wachter et al.	7,143,939 B2	12/2006	Henzerling
6,522,886 B1	2/2003	Youngs et al.	7,178,106 B2	2/2007	Lamkin et al.
6,587,127 B1	7/2003	Leeke et al.	7,187,947 B1	3/2007	White et al.
6,611,537 B1	8/2003	Edens et al.	7,236,773 B2	6/2007	Thomas
6,631,410 B1	10/2003	Kowalski et al.	7,269,338 B2	9/2007	Janevski
6,703,940 B1	3/2004	Allen et al.	7,295,548 B2	11/2007	Blank et al.
6,721,489 B1	4/2004	Benyamin et al.	7,312,785 B2	12/2007	Tsuk et al.
6,728,531 B1	4/2004	Lee et al.	7,313,384 B1	12/2007	Meenan et al.
6,732,155 B2	5/2004	Meek	7,358,960 B2	4/2008	Mak
			7,391,791 B2	6/2008	Balassanian et al.
			7,430,181 B1	9/2008	Hong
			7,483,538 B2	1/2009	McCarty et al.
			7,509,181 B2	3/2009	Champion
			7,571,014 B1	8/2009	Lambourne et al.
			7,583,886 B2	9/2009	Komi et al.
			7,630,501 B2	12/2009	Blank et al.
			7,643,894 B2	1/2010	Braithwaite et al.
			7,647,613 B2	1/2010	Drakoulis et al.
			7,657,910 B1	2/2010	McAulay et al.
			7,689,304 B2	3/2010	Sasaki
			7,716,699 B2	5/2010	Evans et al.
			7,725,533 B2	5/2010	Szeto et al.
			7,725,551 B2	5/2010	Szeto et al.
			7,742,740 B2	6/2010	Goldberg et al.
			7,770,314 B2	8/2010	Dean
			7,792,920 B2	9/2010	Istvan et al.
			7,797,446 B2	9/2010	Heller et al.
			7,797,719 B2	9/2010	Drakoulis et al.
			7,805,682 B1	9/2010	Lambourne et al.
			7,827,259 B2	11/2010	Heller et al.
			7,853,341 B2	12/2010	McCarty et al.
			7,895,633 B2	2/2011	Van Hoff et al.
			7,958,441 B2	6/2011	Heller et al.
			7,987,294 B2	7/2011	Bryce et al.
			8,014,423 B2	9/2011	Thaler et al.
			8,045,952 B2	10/2011	Qureshey et al.
			8,050,652 B2	11/2011	Qureshey et al.
			8,055,364 B2	11/2011	Champion
			8,060,407 B1	11/2011	Delker et al.
			8,072,905 B2	12/2011	Haff et al.
			8,074,253 B1	12/2011	Nathan
			8,099,313 B2	1/2012	Messer et al.
			8,103,009 B2	1/2012	McCarty et al.
			8,111,132 B2	2/2012	Allen et al.
			8,131,390 B2	3/2012	Braithwaite et al.
			8,140,974 B2	3/2012	Hayter et al.
			8,148,622 B2	4/2012	Rothkopf et al.
			8,156,435 B2	4/2012	Wohlert
			8,204,890 B1	6/2012	Gogan et al.
			8,214,740 B2	7/2012	Johnson
			8,234,395 B2	7/2012	Millington et al.
			8,290,603 B1	10/2012	Lambourne et al.
			8,316,154 B2	11/2012	Yoneda et al.
			8,364,296 B2	1/2013	Wilhelm
			8,407,623 B2	3/2013	Kerr et al.
			8,483,853 B1	7/2013	Lambourne et al.
			8,544,046 B2	9/2013	Gran et al.
			8,588,949 B2	11/2013	Lambourne et al.
			8,601,394 B2	12/2013	Sheehan et al.
			8,688,431 B2	4/2014	Lyons et al.
			8,688,991 B1	4/2014	Sunil
			8,750,677 B2	6/2014	Brown et al.
			8,799,395 B2	8/2014	Seidel et al.
			8,818,538 B2	8/2014	Sakata
			8,843,586 B2	9/2014	Pantos et al.
			8,880,648 B1	11/2014	Arora et al.
			8,942,252 B2	1/2015	Balassanian et al.

US 10,779,033 B2

Page 3

(56)

References Cited

U.S. PATENT DOCUMENTS

8,954,177 B2	2/2015	Sanders	2007/0220150 A1	9/2007	Garg
8,965,544 B2	2/2015	Ramsay	2007/0266065 A1	11/2007	Rosenberg et al.
8,966,394 B2	2/2015	Gates et al.	2007/0288470 A1	12/2007	Kauniskangas et al.
9,137,602 B2	9/2015	Mayman et al.	2008/0005690 A1	1/2008	Van Vugt
9,179,199 B2	11/2015	Alsina et al.	2008/0010372 A1	1/2008	Khedouri et al.
9,195,775 B2	11/2015	Al-Shaykh et al.	2008/0016465 A1	1/2008	Foxenland
9,232,279 B2	1/2016	Beeson et al.	2008/0018625 A1	1/2008	Ijichi et al.
9,241,355 B2	1/2016	Schulert et al.	2008/0025535 A1	1/2008	Rajapakse
9,286,384 B2	3/2016	Kuper et al.	2008/0059567 A1	3/2008	Williams et al.
9,338,206 B2	5/2016	Keum et al.	2008/0085098 A1	4/2008	Ullmann
9,374,607 B2	6/2016	Bates et al.	2008/0086379 A1	4/2008	Dion et al.
9,507,780 B2	11/2016	Rothkopf et al.	2008/0109852 A1	5/2008	Kretz et al.
9,563,703 B2	2/2017	Nijim et al.	2008/0133715 A1	6/2008	Yoneda et al.
9,609,448 B2	3/2017	Bentley et al.	2008/0133763 A1	6/2008	Clark et al.
9,635,068 B2	4/2017	Garmark et al.	2008/0134256 A1	6/2008	DaCosta
9,665,339 B2	5/2017	Reimann et al.	2008/0157991 A1	7/2008	Raghunath et al.
9,735,978 B2	8/2017	Kumar et al.	2008/0162668 A1	7/2008	Miller
9,977,561 B2	5/2018	Bates et al.	2008/0177822 A1	7/2008	Yoneda et al.
2001/0042107 A1	11/2001	Palm	2008/0183840 A1	7/2008	Khedouri et al.
2002/0002039 A1	1/2002	Qureshey et al.	2008/0209487 A1	8/2008	Osann et al.
2002/0022453 A1	2/2002	Balog et al.	2008/0215169 A1	9/2008	Debettencourt et al.
2002/0026442 A1	2/2002	Lipscomb et al.	2008/0221715 A1	9/2008	Krzyzanowski et al.
2002/0124097 A1	9/2002	Isely et al.	2008/0242222 A1	10/2008	Bryce et al.
2002/0165921 A1	11/2002	Sapieyevski	2008/0243278 A1	10/2008	Dalton et al.
2002/0174269 A1	11/2002	Spurgat et al.	2008/0292120 A1	11/2008	Wilson
2002/0178191 A1	11/2002	Sielken	2009/0006542 A1	1/2009	Feldman et al.
2002/0194309 A1	12/2002	Carter et al.	2009/0006968 A1	1/2009	Trask et al.
2003/0023741 A1	1/2003	Tomassetti et al.	2009/0059512 A1	3/2009	Lydon et al.
2003/0079038 A1	4/2003	Robbin et al.	2009/0097818 A1	4/2009	Hirata
2003/0157951 A1	8/2003	Hasty	2009/0099919 A1	4/2009	Schultheiss et al.
2003/0198257 A1	10/2003	Sullivan et al.	2009/0132712 A1	5/2009	P et al.
2003/0210796 A1	11/2003	McCarty et al.	2009/0150491 A1	6/2009	Yamamoto
2004/0024478 A1	2/2004	Hans et al.	2009/0171487 A1	7/2009	Wilhelm et al.
2004/0025185 A1	2/2004	Goci et al.	2009/0172542 A1	7/2009	Girish et al.
2004/0078383 A1	4/2004	Mercer et al.	2009/0197524 A1	8/2009	Haff et al.
2004/0078812 A1	4/2004	Calvert	2009/0222392 A1	9/2009	Martin et al.
2004/0138948 A1	7/2004	Loomis	2009/0228123 A1	9/2009	Fontijn
2004/0215611 A1	10/2004	Jawa et al.	2009/0228919 A1	9/2009	Zott et al.
2004/0261040 A1	12/2004	Radcliffe et al.	2009/0248702 A1	10/2009	Schwartz et al.
2005/0028225 A1	2/2005	Dawson et al.	2009/0249222 A1	10/2009	Schmidt et al.
2005/0108320 A1	5/2005	Lord et al.	2009/0259765 A1	10/2009	Karlsson et al.
2005/0138193 A1	6/2005	Encarnacion et al.	2009/0275285 A1	11/2009	Maricevic et al.
2005/0155072 A1	7/2005	Kaczowka et al.	2010/0005496 A1	1/2010	Ellis et al.
2005/0166157 A1	7/2005	Ollis et al.	2010/0009674 A1	1/2010	Sapkota et al.
2005/0177624 A1	8/2005	Oswald et al.	2010/0027966 A1	2/2010	Harrang et al.
2005/0216855 A1	9/2005	Kopra et al.	2010/0031366 A1	2/2010	Knight et al.
2005/0235334 A1	10/2005	Togashi et al.	2010/0042235 A1	2/2010	Basso et al.
2005/0240494 A1	10/2005	Cue et al.	2010/0082567 A1	4/2010	Rosenblatt et al.
2005/0262253 A1	11/2005	Li et al.	2010/0082725 A1	4/2010	Onishi et al.
2006/0002681 A1	1/2006	Spilo et al.	2010/0082731 A1	4/2010	Haughay et al.
2006/0041577 A1	2/2006	Ellicott et al.	2010/0087214 A1	4/2010	Bournel et al.
2006/0041639 A1	2/2006	Lamkin et al.	2010/0094833 A1	4/2010	Svendsen et al.
2006/0062094 A1	3/2006	Nathan et al.	2010/0095332 A1	4/2010	Gran et al.
2006/0107237 A1	5/2006	Kim	2010/0114979 A1	5/2010	Petersen et al.
2006/0153040 A1	7/2006	Girish et al.	2010/0121891 A1	5/2010	Zampello
2006/0156236 A1	7/2006	Heller et al.	2010/0131978 A1	5/2010	Friedlander et al.
2006/0168340 A1	7/2006	Heller et al.	2010/0198767 A1	8/2010	Farrelly
2006/0195480 A1	8/2006	Spiegelman et al.	2010/0206815 A1	8/2010	Garusi et al.
2006/0195521 A1	8/2006	New et al.	2010/0211438 A1	8/2010	Lutnick et al.
2006/0195864 A1	8/2006	New et al.	2010/0250669 A1	9/2010	Pan et al.
2006/0218294 A1	9/2006	Rosenberg	2010/0268360 A1	10/2010	Ingrassia et al.
2006/0253782 A1	11/2006	Stark et al.	2010/0299402 A1	11/2010	Korman et al.
2006/0258289 A1	11/2006	Dua	2010/0299639 A1	11/2010	Ramsay et al.
2006/0263048 A1	11/2006	Sato et al.	2010/0303244 A1	12/2010	Kim et al.
2006/0294201 A1	12/2006	Kito et al.	2010/0306815 A1	12/2010	Emerson et al.
2007/0038999 A1	2/2007	Millington et al.	2010/0318917 A1	12/2010	Holladay et al.
2007/0053514 A1	3/2007	Imai et al.	2010/0332565 A1	12/2010	Al-Shaykh et al.
2007/0061725 A1	3/2007	Isaac et al.	2011/0004330 A1	1/2011	Rothkopf et al.
2007/0067808 A1	3/2007	DaCosta	2011/0047574 A1	2/2011	Tecot et al.
2007/0083897 A1	4/2007	Brownell	2011/0054641 A1	3/2011	Hur et al.
2007/0086724 A1	4/2007	Grady et al.	2011/0055901 A1	3/2011	Karaoguz et al.
2007/0106672 A1	5/2007	Sighart et al.	2011/0060998 A1	3/2011	Schwartz et al.
2007/0106726 A1	5/2007	Rosenberg	2011/0063317 A1	3/2011	Gharaat et al.
2007/0142944 A1	6/2007	Goldberg et al.	2011/0066943 A1	3/2011	Brillon et al.
2007/0169087 A1	7/2007	Fadell	2011/0125809 A1	5/2011	Woods et al.
			2011/0126104 A1	5/2011	Woods et al.
			2011/0131272 A1	6/2011	Littlejohn et al.
			2011/0131518 A1	6/2011	Ohashi et al.
			2011/0131520 A1	6/2011	Al-Shaykh et al.

US 10,779,033 B2

Page 4

(56)

References Cited

U.S. PATENT DOCUMENTS

2011/0173666	A1	7/2011	Yu et al.
2011/0179455	A1	7/2011	Thompson et al.
2011/0218656	A1	9/2011	Bishop et al.
2011/0225496	A1	9/2011	Jeffe et al.
2011/0231660	A1	9/2011	Kanungo
2011/0252118	A1	10/2011	Pantos et al.
2011/0265003	A1	10/2011	Schubert et al.
2011/0295974	A1	12/2011	Kashef et al.
2012/0029672	A1	2/2012	Hamilton et al.
2012/0038541	A1	2/2012	Song et al.
2012/0040720	A1	2/2012	Zhang et al.
2012/0050012	A1	3/2012	Alsina et al.
2012/0054808	A1	3/2012	Nijim et al.
2012/0057853	A1	3/2012	Huber et al.
2012/0088477	A1	4/2012	Cassidy et al.
2012/0089910	A1	4/2012	Cassidy et al.
2012/0113964	A1	5/2012	Petersen et al.
2012/0116883	A1	5/2012	Asam et al.
2012/0117026	A1	5/2012	Cassidy et al.
2012/0117193	A1	5/2012	Phillips et al.
2012/0117586	A1	5/2012	McCoy et al.
2012/0131125	A1	5/2012	Seidel et al.
2012/0147825	A1	6/2012	Hassan et al.
2012/0159372	A1	6/2012	Stallings et al.
2012/0174204	A1	7/2012	Sturm et al.
2012/0185770	A1	7/2012	Hwang et al.
2012/0190398	A1	7/2012	Leukkunen et al.
2012/0192071	A1	7/2012	Millington
2012/0202485	A1	8/2012	Mirbaha et al.
2012/0227076	A1	9/2012	McCoy et al.
2012/0233067	A1	9/2012	Matthew et al.
2012/0272062	A1	10/2012	Lee et al.
2012/0284423	A1	11/2012	Weel et al.
2012/0304233	A1	11/2012	Roberts et al.
2012/0311094	A1	12/2012	Biderman et al.
2012/0311618	A1	12/2012	Blaxland et al.
2013/0014015	A1	1/2013	Lambourne et al.
2013/0024018	A1	1/2013	Chang et al.
2013/0028263	A1	1/2013	Rajapakse et al.
2013/0047084	A1	2/2013	Sanders et al.
2013/0054742	A1	2/2013	Tsuji et al.
2013/0086003	A1	4/2013	Alsina et al.
2013/0111529	A1	5/2013	Yao et al.
2013/0117299	A1	5/2013	Kraatz et al.
2013/0151728	A1	6/2013	Currier et al.
2013/0157566	A1	6/2013	Oguchi et al.
2013/0165164	A1	6/2013	Rowe et al.
2013/0167029	A1	6/2013	Friesen et al.
2013/0198264	A1	8/2013	Hellman et al.
2013/0246916	A1	9/2013	Reimann et al.
2013/0254207	A1	9/2013	Coburn, IV et al.
2013/0290419	A1	10/2013	Spencer et al.
2013/0300546	A1	11/2013	Kim et al.
2013/0326041	A1	12/2013	Bellet et al.
2013/0346559	A1	12/2013	Van Erven et al.
2013/0347117	A1	12/2013	Parks et al.
2014/0006483	A1	1/2014	Garmark et al.
2014/0006947	A1	1/2014	Garmark et al.
2014/0052770	A1	2/2014	Gran et al.
2014/0074959	A1	3/2014	Alsina et al.
2014/0075308	A1	3/2014	Sanders et al.
2014/0075314	A1	3/2014	Bachman et al.
2014/0080479	A1	3/2014	Vangala et al.
2014/0096166	A1	4/2014	Gordon et al.
2014/0108929	A1	4/2014	Garmark et al.
2014/0115462	A1	4/2014	Reznor et al.
2014/0122589	A1	5/2014	Fyke et al.
2014/0122737	A1	5/2014	Silberstein et al.
2014/0123005	A1	5/2014	Forstall et al.
2014/0140530	A1	5/2014	Gomes-Casseres et al.
2014/0169569	A1	6/2014	Toivanen et al.
2014/0181655	A1*	6/2014	Kumar G06F 3/0488
2014/0195587	A1	7/2014	Sukoff et al.
2014/0195925	A1	7/2014	Wikander et al.

715/716

2014/0215009	A1	7/2014	Zhang et al.
2014/0229959	A1	8/2014	Beckhardt et al.
2014/0277651	A1	9/2014	Gomes-Casseres et al.
2014/0282882	A1	9/2014	Tsui et al.
2014/0378056	A1	12/2014	Liu et al.
2015/0026613	A1	1/2015	Kwon et al.
2015/0074527	A1	3/2015	Sevigny et al.
2015/0074528	A1	3/2015	Sakalowsky et al.
2015/0256954	A1	9/2015	Carlsson et al.
2015/0286360	A1	10/2015	Wachter et al.
2015/0296268	A1	10/2015	Lee et al.
2015/0304476	A1	10/2015	Katada et al.
2016/0048485	A1	2/2016	Sherwood et al.
2017/0068507	A1*	3/2017	Kim G06F 3/04817
2017/0251314	A1*	8/2017	Pye, Jr. G06F 3/04817
2017/0293688	A1	10/2017	Kumar et al.
2018/0088901	A1*	3/2018	Drinkwater G06F 3/165
2018/0121158	A1*	5/2018	Hinokio G06F 3/04817

FOREIGN PATENT DOCUMENTS

CN	1684423	A	10/2005
CN	1906604	A	1/2007
CN	101009127	A	8/2007
CN	101212823	A	7/2008
CN	101222493	A	7/2008
CN	101268473	A	9/2008
CN	101410773	A	4/2009
CN	101595711	A	12/2009
CN	102098538	A	6/2011
CN	102171687	A	8/2011
CN	102281294	A	12/2011
EP	1389853	A1	2/2004
EP	2023578	A1	2/2009
JP	2007060123	A	3/2007
JP	2007512718	A	5/2007
JP	2007199220	A	8/2007
JP	2008027537	A	2/2008
JP	2009044410		2/2009
JP	2010067097	A	3/2010
JP	2010510696		4/2010
JP	4752793	B2	8/2011
JP	4929520	B2	5/2012
JP	2012248199	A	12/2012
JP	2013101631	A	5/2013
KR	20090017795		2/2009
WO	9709756	A2	3/1997
WO	200153994		7/2001
WO	2003093950	A2	11/2003
WO	2005013047	A2	2/2005
WO	2006101635	A3	12/2007
WO	2008047184	A1	4/2008
WO	2009086599	A1	7/2009
WO	2011049497	A1	4/2011
WO	2013049346	A1	4/2013
WO	2013055661	A1	4/2013
WO	2013101727		7/2013
WO	2014149533	A2	9/2014
WO	2014172462	A1	10/2014

OTHER PUBLICATIONS

Chinese Patent Office, Second Office Action dated Oct. 18, 2018, issued in connection with Chinese Application No. 201480034098. 0, 7 pages.

Chinese Patent Office, Second Office Action dated Nov. 28, 2018, issued in connection with Chinese Application No. 201480033788. 4, 8 pages.

Chinese Patent Office, Second Office Action dated Nov. 28, 2018, issued in connection with Chinese Application No. 201480034088. 7, 9 pages.

Chinese Patent Office, Third Office Action dated Mar. 12, 2019, issued in connection with Chinese Application No. 201480034088. 7, 7 pages.

Corrected Notice of Allowance dated Oct. 6, 2016, issued in connection with U.S. Appl. No. 13/904,949, filed May 29, 2013, 9 pages.

US 10,779,033 B2

Page 5

(56)

References Cited

OTHER PUBLICATIONS

- Dell, Inc. "Dell Digital Audio Receiver: Reference Guide," Jun. 2000, 70 pages.
- Dell, Inc. "Start Here," Jun. 2000, 2 pages.
- "Denon 2003-2004 Product Catalog," Denon, 2003-2004, 44 pages.
- European Patent Office, European Extended Search Report dated Aug. 16, 2017, issued in connection with EP Application No. 16160758.5, 9 pages.
- European Patent Office, European Office Action dated Aug. 10, 2018, issued in connection with European Application No. 16160758.5, 4 pages.
- European Patent Office, European Office Action dated Nov. 14, 2017, issued in connection with EP Application No. 14803651.0, 4 pages.
- European Patent Office, European Office Action dated Oct. 6, 2017, issued in connection with EP Application No. 14784965.7, 5 pages.
- European Patent Office, Exam Report dated Apr. 28, 2016, issued in connection with European Patent Application No. 12861517.6, 6 pages.
- European Patent Office, Extended European Search Report dated Aug. 1, 2016, issued in connection with European patent application No. 16160758.5, 11 pages.
- European Patent Office, Extended European Search Report dated Jun. 7, 2016, issued in connection with European patent application No. 14803651.0, 10 pages.
- European Patent Office, Extended European Search Report dated Jun. 9, 2015, issued in connection with European patent application No. 12861517.6, 11 pages.
- European Patent Office, Extended European Search Report dated Sep. 9, 2016, issued in connection with European patent application No. 14785247.9, 10 pages.
- European Patent Office, Office Action dated Apr. 7, 2017, issued in connection with European Application No. 14803651.0, 4 pages.
- European Patent Office, Office Action dated May 11, 2017, issued in connection with European Application No. 14785247.9, 9 pages.
- European Patent Office, Summons to Attend Oral Proceedings mailed on Dec. 1, 2016, issued in connection with European Application No. 12861517.6-1905, 11 pages.
- Final Office Action dated Jun. 2, 2016, issued in connection with U.S. Appl. No. 14/520,566, filed Oct. 22, 2014, 12 pages.
- Final Office Action dated Aug. 6, 2013, issued in connection with U.S. Appl. No. 13/341,237, filed Dec. 30, 2011, 14 pages.
- Final Office Action dated Dec. 7, 2015, issued in connection with U.S. Appl. No. 13/864,075, filed Apr. 16, 2013, 16 pages.
- Final Office Action dated Feb. 7, 2017, issued in connection with U.S. Appl. No. 14/628,952, filed Feb. 23, 2015, 15 pages.
- Japanese Patent Office, Office Action dated Jan. 10, 2017, issued in connection with Japanese Patent Application No. 2016-509046, 7 pages.
- Final Office Action dated Jul. 8, 2015, issued in connection with U.S. Appl. No. 14/520,566, filed Oct. 22, 2014, 8 pages.
- Final Office Action dated Mar. 10, 2016, issued in connection with U.S. Appl. No. 13/904,932, filed May 29, 2013, 16 pages.
- Final Office Action dated Apr. 14, 2014, issued in connection with U.S. Appl. No. 13/341,237, filed Dec. 30, 2011, 12 pages.
- Final Office Action dated Dec. 15, 2017, issued in connection with U.S. Appl. No. 13/904,909, filed May 29, 2013, 12 pages.
- Final Office Action dated May 15, 2017, issued in connection with U.S. Appl. No. 14/520,566, filed Oct. 22, 2014, 12 pages.
- Final Office Action dated Mar. 18, 2019, issued in connection with U.S. Appl. No. 14/956,640, filed Dec. 2, 2015, 12 pages.
- Final Office Action dated May 19, 2016, issued in connection with U.S. Appl. No. 14/520,578, filed Oct. 22, 2014, 12 pages.
- Final Office Action dated Jan. 20, 2016, issued in connection with U.S. Appl. No. 14/628,952, filed Feb. 23, 2015, 10 pages.
- Final Office Action dated Sep. 20, 2017, issued in connection with U.S. Appl. No. 13/904,936, filed May 29, 2013, 22 pages.
- Final Office Action dated Mar. 21, 2016, issued in connection with U.S. Appl. No. 13/904,896, filed May 29, 2013, 19 pages.
- Final Office Action dated Sep. 21, 2016, issued in connection with U.S. Appl. No. 13/904,923, filed May 29, 2013, 19 pages.
- Final Office Action dated Apr. 22, 2015, issued in connection with U.S. Appl. No. 13/341,237, filed Dec. 30, 2011, 11 pages.
- Final Office Action dated Jun. 23, 2015, issued in connection with U.S. Appl. No. 13/904,896, filed May 29, 2013, 16 pages.
- Final Office Action dated Oct. 23, 2015, issued in connection with U.S. Appl. No. 13/904,944, filed May 29, 2013, 13 pages.
- Final Office Action dated Aug. 24, 2016, issued in connection with U.S. Appl. No. 13/341,237, filed Dec. 30, 2011, 12 pages.
- Final Office Action dated Aug. 25, 2015, issued in connection with U.S. Appl. No. 13/864,081, filed Apr. 16, 2013, 15 pages.
- Final Office Action dated Sep. 25, 2015, issued in connection with U.S. Appl. No. 13/904,949, filed May 29, 2013, 14 pages.
- Final Office Action dated Aug. 28, 2015, issued in connection with U.S. Appl. No. 13/904,936, filed May 29, 2013, 10 pages.
- Final Office Action dated Aug. 29, 2016, issued in connection with U.S. Appl. No. 13/904,936, filed May 29, 2013, 21 pages.
- Final Office Action dated Jan. 7, 2019, issued in connection with U.S. Appl. No. 15/872,500, filed Jan. 16, 2018, 7 pages.
- Final Office Action dated Feb. 8, 2019, issued in connection with U.S. Appl. No. 13/904,909, filed May 29, 2013, 16 pages.
- First Action Interview Office Action dated Jun. 20, 2016, issued in connection with U.S. Appl. No. 14/520,578, filed Oct. 22, 2014, 5 pages.
- International Bureau, International Preliminary Report on Patentability, dated Jul. 10, 2014, issued in connection with International Application No. PCT/US2012/071212, filed Dec. 21, 2012, 8 pages.
- International Bureau, International Preliminary Report on Patentability dated Feb. 8, 2018, issued in connection with International Application No. PCT/US2016/043840, filed Jul. 25, 2016, 10 pages.
- International Bureau, International Preliminary Report on Patentability, dated Oct. 29, 2015, issued in connection with International Application No. PCT/US2014/034290, filed Apr. 16, 2014, 7 pages.
- International Bureau, International Preliminary Report on Patentability, dated Oct. 29, 2015, issued in connection with International Application No. PCT/US2014/034372, filed Apr. 16, 2014, 8 pages.
- International Bureau, International Preliminary Report on Patentability, dated Oct. 29, 2015, issued in connection with International Application No. PCT/US2014/034292, filed Apr. 16, 2014, 6 pages.
- International Searching Authority, International Report on Patentability dated Dec. 10, 2015, issued in connection with International Application No. PCT/US2014/039669, filed May 28, 2014, 6 pages.
- International Searching Authority, International Search Report dated Aug. 14, 2014, issued in connection with International Application No. PCT/US2014/034292, 3 pages.
- International Searching Authority, International Search Report dated Aug. 20, 2014, issued in connection with International Application No. PCT/US2014/034372, filed Apr. 16, 2014, 3 pages.
- International Searching Authority, International Search Report dated Aug. 21, 2014, issued in connection with International Application No. PCT/US2014/034290, filed Apr. 16, 2014, 3 pages.
- International Searching Authority, International Search Report dated Sep. 22, 2014, issued in connection with International Application No. PCT/US2014/039669, filed May 28, 2014, 3 pages.
- International Searching Authority, Written Opinion dated Aug. 14, 2014, issued in connection with International Application No. PCT/US2014/034292, filed Apr. 16, 2014, 4 pages.
- International Searching Authority, Written Opinion dated Aug. 20, 2014, issued in connection with International Application No. PCT/US2014/034372, filed Apr. 16, 2014, 6 pages.
- International Searching Authority, Written Opinion dated Aug. 21, 2014, issued in connection with International Application No. PCT/US2014/034290, filed Apr. 16, 2014, 5 pages.
- International Searching Authority, Written Opinion dated Sep. 22, 2014, issued in connection with International Application No. PCT/US2014/039669, filed May 28, 2014, 5 pages.
- Japanese Patent Office, Final Office Action dated Sep. 19, 2017, issued in connection with Japanese Patent Application No. 2016-509047, 1 page.
- Japanese Patent Office, Japanese Office Action dated Jul. 12, 2016, issued in connection with Japanese Application No. 2014-550400, 10 pages.

US 10,779,033 B2

Page 6

(56)

References Cited

OTHER PUBLICATIONS

Japanese Patent Office, Japanese Office Action dated Oct. 20, 2015, issued in connection with Japanese Application No. 2014-550400, 8 pages.

Japanese Patent Office, Non-Final Office Action dated Mar. 28, 2017, issued in connection with Japanese Patent Application No. 2016-516750, 5 pages.

Japanese Patent Office, Notice of Rejection dated Dec. 20, 2016, issued in connection with Japanese Application No. 2016-509069, 6 pages.

Notice of Allowance dated Nov. 16, 2018, issued in connection with U.S. Appl. No. 15/626,793, filed Jun. 19, 2017, 13 pages.

Notice of Allowance dated Aug. 17, 2017, issued in connection with U.S. Appl. No. 13/904,923, filed May 29, 2013, 23 pages.

Notice of Allowance dated Nov. 17, 2016, issued in connection with U.S. Appl. No. 13/904,949, filed May 29, 2013, 12 pages.

Notice of Allowance dated Oct. 17, 2017, issued in connection with U.S. Appl. No. 14/520,578, filed Oct. 22, 2014, 8 pages.

Notice of Allowance dated Sep. 20, 2016, issued in connection with U.S. Appl. No. 13/904,949, filed May 29, 2013, 12 pages.

Notice of Allowance dated Aug. 21, 2017, issued in connection with U.S. Appl. No. 14/520,566, filed Oct. 22, 2014, 7 pages.

Notice of Allowance dated Nov. 21, 2018, issued in connection with U.S. Appl. No. 16/107,025, filed Aug. 21, 2018, 14 pages.

Notice of Allowance dated Dec. 22, 2017, issued in connection with U.S. Appl. No. 13/904,936, filed May 29, 2013, 10 pages.

Notice of Allowance dated Nov. 23, 2016, issued in connection with U.S. Appl. No. 13/904,896, filed May 29, 2013, 18 pages.

Notice of Allowance dated Nov. 23, 2016, issued in connection with U.S. Appl. No. 13/904,932, filed May 29, 2013, 5 pages.

Notice of Allowance dated Jan. 25, 2017, issued in connection with U.S. Appl. No. 13/341,237, filed Dec. 30, 2011, 7 pages.

Notice of Allowance dated Feb. 26, 2016, issued in connection with U.S. Appl. No. 13/864,081, filed Apr. 16, 2013, 13 pages.

Notice of Allowance dated Feb. 26, 2019, issued in connection with U.S. Appl. No. 15/263,628, filed Sep. 13, 2016, 11 pages.

Notice of Allowance dated Jun. 28, 2017, issued in connection with U.S. Appl. No. 13/904,896, filed May 29, 2013, 17 pages.

Notice of Allowance dated Jun. 28, 2019, issued in connection with U.S. Appl. No. 14/956,640, filed Dec. 2, 2015, 8 pages.

Notice of Allowance dated Apr. 3, 2019, issued in connection with U.S. Appl. No. 15/135,423, filed Apr. 21, 2016, 9 pages.

Notice of Allowance dated Oct. 3, 2018, issued in connection with U.S. Appl. No. 16/107,053, filed Aug. 21, 2018, 17 pages.

Notice of Allowance dated Oct. 30, 2017, issued in connection with U.S. Appl. No. 14/628,952, filed Feb. 23, 2015, 8 pages.

Notice of Allowance dated Aug. 31, 2016, issued in connection with U.S. Appl. No. 14/520,566, filed Oct. 22, 2014, 7 pages.

Notice of Allowance dated Apr. 4, 2017, issued in connection with U.S. Appl. No. 13/904,932, filed May 29, 2013, 5 pages.

Notice of Allowance dated Jan. 7, 2019, issued in connection with U.S. Appl. No. 16/107,092, filed Aug. 21, 2018, 13 pages.

Notification of Reopening of Prosecution Due to Consideration of an Information Disclosure Statement Filed After Mailing of a Notice Allowance dated Jan. 20, 2017, issued in connection with U.S. Appl. No. 14/520,566, filed Oct. 22, 2014, 2 pages.

"Sonos Multi-Room Music System User Guide," Version 090401, Sonos, Inc. Apr. 1, 2009, 256 pages.

"Sonos Wireless Dock Product Guide," Version 100101, Sonos, Inc. Oct. 10, 2001, 196 pages.

"Sonos™ Digital Music System User Guide", Version: 070101, Sonos, Inc., Jan. 2007, 179 pages.

Palm, Inc., "Handbook for the Palm VII Handheld," May 2000, 311 pages.

Pre-Interview First Office Action dated Dec. 22, 2015, issued in connection with U.S. Appl. No. 14/520,578, filed Oct. 22, 2014, 9 pages.

Presentations at WinHEC 2000, May 2000, 138 pages.

PRISMIQ, Inc., "PRISMIQ Media Player User Guide," 2003, 44 pages.

Ritchie et al., "UPnP AV Architecture:2 for UPnP Version 1.0", 2010, XP055032201, retrieved from the internet: URL: http://upnp.org/specs/av/UPnP-av_AVArchitecture-v2.pdf, 35 pages.

Supplemental Notice of Allowability dated Nov. 4, 2015, issued in connection with U.S. Appl. No. 13/864,086, filed Apr. 16, 2013, 2 pages.

Supplemental Notice of Allowance dated Dec. 21, 2016, issued in connection with U.S. Appl. No. 13/904,949, filed May 29, 2013, 2 pages.

U.S. Appl. No. 60/490,768, filed Jul. 28, 2003, entitled "Method for synchronizing audio playback between multiple networked devices," 13 pages.

U.S. Appl. No. 60/825,407, filed Sep. 12, 2006, entitled "Controlling and manipulating groupings in a multi-zone music or media system," 82 pages.

UPnP; "Universal Plug and Play Device Architecture," Jun. 8, 2000; version 1.0; Microsoft Corporation; pp. 1-54.

"Welcome. You're watching Apple TV." Apple TV 1st Generation Setup Guide, Apr. 8, 2008 Retrieved Oct. 14, 2014, 40 pages.

"Welcome. You're watching Apple TV." Apple TV 2nd Generation Setup Guide, Mar. 10, 2011 Retrieved Oct. 16, 2014, 36 pages.

"Welcome. You're watching Apple TV." Apple TV 3rd Generation Setup Guide, Mar. 16, 2012 Retrieved Oct. 16, 2014, 36 pages.

Yamaha DME 64 Owner's Manual; copyright 2004, 80 pages.

Yamaha DME Designer 3.5 setup manual guide; copyright 2004, 16 pages.

Yamaha DME Designer 3.5 User Manual; Copyright 2004, 507 pages.

Bluetooth. "Specification of the Bluetooth System: The ad hoc SCATTERNET for affordable and highly functional wireless connectivity," Core, Version 1.0 A, Jul. 26, 1999, 1068 pages.

Bluetooth. "Specification of the Bluetooth System: Wireless connections made easy," Core, Version 1.0 B, Dec. 1, 1999, 1076 pages.

Advisory Action dated Dec. 2, 2015, issued in connection with U.S. Appl. No. 13/904,936, filed May 29, 2013, 4 pages.

Advisory Action dated Dec. 5, 2016, issued in connection with U.S. Appl. No. 13/904,923, filed May 29, 2013, 5 pages.

Advisory Action dated May 1, 2019, issued in connection with U.S. Appl. No. 13/904,909, filed May 29, 2013, 3 pages.

Advisory Action dated Mar. 13, 2018, issued in connection with U.S. Appl. No. 13/904,909, filed May 29, 2013, 3 pages.

Advisory Action dated Apr. 14, 2017, issued in connection with U.S. Appl. No. 14/628,952, filed Feb. 23, 2015, 3 pages.

Advisory Action dated Dec. 16, 2015, issued in connection with U.S. Appl. No. 13/904,949, filed May 29, 2013, 11 pages.

Advisory Action dated Jun. 16, 2016, issued in connection with U.S. Appl. No. 13/904,896, filed May 29, 2013, 5 pages.

Advisory Action dated Oct. 16, 2013, issued in connection with U.S. Appl. No. 13/341,237, filed Dec. 30, 2011, 3 pages.

Advisory Action dated Sep. 17, 2015, issued in connection with U.S. Appl. No. 14/520,566, filed Oct. 22, 2014, 4 pages.

Advisory Action dated Feb. 25, 2016, issued in connection with U.S. Appl. No. 13/904,944, filed May 29, 2013, 4 pages.

Advisory Action dated Apr. 29, 2016, issued in connection with U.S. Appl. No. 13/864,075, filed Apr. 16, 2013, 3 pages.

Advisory Action dated Oct. 29, 2015, issued in connection with U.S. Appl. No. 13/864,081, filed Apr. 16, 2013, 3 pages.

Anonymous, "Sonos Controller for Mac or PC Product Guide", Retrieved from the Internet, XP055254086, 2013, 108 pages.

AudioTron Quick Start Guide, Version 1.0, Mar. 2001, 24 pages.

AudioTron Reference Manual, Version 3.0, May 2002, 70 pages.

AudioTron Setup Guide, Version 3.0, May 2002, 38 pages.

Australian Intellectual Property Office, Patent Examination Report No. 1 dated Jan. 16, 2015, issued in connection with Australian Patent Application No. 2012362573, 3 pages.

Australian Patent Office, Examination Report dated Mar. 22, 2017, issued in connection with Australian Application No. 2016202175, 3 pages.

European Patent Office, Extended European Search Report dated Nov. 21, 2016, issued in connection with European Application No. 14784965.7-1870, 6 pages.

US 10,779,033 B2

Page 7

(56)

References Cited

OTHER PUBLICATIONS

European Patent Office, Extended European Search Report dated Oct. 18, 2016, issued in connection with European patent application No. 14785806.2, 9 pages.

Canadian Patent Office, Canadian Office Action dated Nov. 3, 2016, issued in connection with Canadian Application No. 2,861,790, 4 pages.

Canadian Patent Office, Canadian Office Action dated Nov. 12, 2015, issued in connection with Canadian Application No. 2,861,790, 3 pages.

Canadian Patent Office, Canadian Office Action dated Nov. 22, 2017, issued in connection with CA Application No. 2861790, 4 pages.

Canadian Patent Office, Office Action dated Sep. 13, 2018, issued in connection with Canadian Application No. 2861790, 4 pages.

Chen et al., "What a Juke! A Collaborative Music Sharing System," World of Wireless, Mobile and Multimedia Networks (WOWMOM), 2012 IEEE International Symposium, 2012, 6 pages.

Chinese Patent Office, Chinese Office Action dated Jan. 5, 2017, issued in connection with Chinese Application No. 201280069674.6, 14 pages.

Chinese Patent Office, First Office Action dated Mar. 5, 2018, issued in connection with Chinese Application No. 2014800424721, 10 pages.

Chinese Patent Office, First Office Action dated Feb. 2, 2018, issued in connection with Chinese Application No. 2014800340980, 11 pages.

Chinese Patent Office, First Office Action dated Jan. 2, 2018, issued in connection with Chinese Application No. 201480033788.4, 16 pages.

Chinese Patent Office, First Office Action dated Jan. 4, 2018, issued in connection with Chinese Application No. 201480034088.7, 15 pages.

Japanese Patent Office, Office Action dated Feb. 14, 2017, issued in connection with Japanese Patent Application No. 2016-509047, 9 pages.

Jo et al., "Synchronized One-to-many Media Streaming with Adaptive Playout Control," Proceedings of SPIE, 2002, pp. 71-82, vol. 4861.

Jones, Stephen, "Dell Digital Audio Receiver: Digital upgrade for your analog stereo," Analog Stereo, Jun. 24, 2000 retrieved Jun. 18, 2014, 2 pages.

Louderback, Jim, "Affordable Audio Receiver Furnishes Homes With MP3," TechTV Vault. Jun. 28, 2000 retrieved Jul. 10, 2014, 2 pages.

Mate et al., "Movable-Multimedia: Session Mobility in Ubiquitous Computing Ecosystem", XP055019030, 2006, 6 pages.

Motorola, "Simplefi, Wireless Digital Audio Receiver, Installation and User Guide," Dec. 31, 2001, 111 pages.

Non-Final Office Action dated Feb. 23, 2017, issued in connection with U.S. Appl. No. 13/904,923, filed May 29, 2013, 21 pages.

Non-Final Office Action dated Feb. 2, 2016, issued in connection with U.S. Appl. No. 13/904,936, filed May 29, 2013, 14 pages.

Non-Final Office Action dated Mar. 2, 2015, issued in connection with U.S. Appl. No. 13/904,896, filed May 29, 2013, 15 pages.

Non-Final Office Action dated Feb. 7, 2017, issued in connection with U.S. Appl. No. 14/520,578, filed Oct. 22, 2014, 5 pages.

Non-Final Office Action dated Oct. 8, 2014, issued in connection with U.S. Appl. No. 13/341,237, filed Dec. 30, 2011, 12 pages.

Non-Final Office Action dated Mar. 9, 2017, issued in connection with U.S. Appl. No. 13/904,936, filed May 29, 2013, 20 pages.

Non-Final Office Action dated May 9, 2017, issued in connection with U.S. Appl. No. 14/628,952, filed Feb. 23, 2015, 12 pages.

Non-Final Office Action dated Mar. 10, 2015, issued in connection with U.S. Appl. No. 13/864,081, filed Apr. 16, 2013, 13 pages.

Non-Final Office Action dated Aug. 12, 2016, issued in connection with U.S. Appl. No. 13/904,909, filed May 29, 2013, 21 pages.

Non-Final Office Action dated Feb. 13, 2015, issued in connection with U.S. Appl. No. 13/904,936, filed May 29, 2013, 10 pages.

Non-Final Office Action dated Mar. 13, 2015, issued in connection with U.S. Appl. No. 13/904,949, filed May 29, 2013, 20 pages.

Non-Final Office Action dated Dec. 14, 2016, issued in connection with U.S. Appl. No. 13/341,237, filed Dec. 30, 2011, 5 pages.

Non-Final Office Action dated Jun. 16, 2016, issued in connection with U.S. Appl. No. 13/904,932, filed May 29, 2013, 15 pages.

Non-Final Office Action dated Oct. 16, 2018, issued in connection with U.S. Appl. No. 15/263,628, filed Sep. 13, 2016, 7 pages.

Non-Final Office Action dated Apr. 17, 2018, issued in connection with U.S. Appl. No. 14/956,640, filed Dec. 2, 2015, 15 pages.

Non-Final Office Action dated Mar. 17, 2016, issued in connection with U.S. Appl. No. 13/904,923, filed May 29, 2013, 15 pages.

Non-Final Office Action dated Oct. 17, 2018, issued in connection with U.S. Appl. No. 15/135,423, filed Apr. 21, 2016, 13 pages.

Non-Final Office Action dated Nov. 18, 2015, issued in connection with U.S. Appl. No. 13/904,896, filed May 29, 2013, 18 pages.

Non-Final Office Action dated Nov. 18, 2015, issued in connection with U.S. Appl. No. 13/904,932, filed May 29, 2013, 12 pages.

Non-Final Office Action dated Aug. 19, 2015, issued in connection with U.S. Appl. No. 13/864,075, filed Apr. 16, 2013, 18 pages.

Non-Final Office Action dated Jan. 19, 2016, issued in connection with U.S. Appl. No. 13/341,237, filed Dec. 30, 2011, 10 pages.

Non-Final Office Action dated Apr. 20, 2018, issued in connection with U.S. Appl. No. 15/872,500, filed Jan. 16, 2018, 7 pages.

Non-Final Office Action dated Feb. 22, 2017, issued in connection with U.S. Appl. No. 14/520,566, filed Oct. 22, 2014, 14 pages.

Non-Final Office Action dated Apr. 23, 2015, issued in connection with U.S. Appl. No. 13/904,944, filed May 29, 2013, 12 pages.

Non-final Office Action dated Mar. 24, 2015, issued in connection with U.S. Appl. No. 13/864,086, filed Apr. 16, 2013, 14 pages.

Non-Final Office Action dated Jan. 25, 2013, issued in connection with U.S. Appl. No. 13/341,237, filed Dec. 30, 2011, 9 pages.

Non-Final Office Action dated Jul. 25, 2016, issued in connection with U.S. Appl. No. 14/628,952, filed Feb. 23, 2015, 12 pages.

Non-Final Office Action dated Mar. 25, 2016, issued in connection with U.S. Appl. No. 13/904,949, filed May 29, 2013, 13 pages.

Non-Final Office Action dated Jul. 26, 2017, issued in connection with U.S. Appl. No. 14/520,578, filed Oct. 22, 2014, 10 pages.

Non-Final Office Action dated Nov. 26, 2013, issued in connection with U.S. Appl. No. 13/341,237, filed Dec. 30, 2011, 15 pages.

Non-Final Office Action dated Dec. 28, 2015, issued in connection with U.S. Appl. No. 14/520,566, filed Oct. 22, 2014, 10 pages.

Non-Final Office Action dated May 28, 2015, issued in connection with U.S. Appl. No. 14/628,952, filed Feb. 23, 2015, 9 pages.

Non-Final Office Action dated Jun. 29, 2018, issued in connection with U.S. Appl. No. 13/904,909, filed May 29, 2013, 18 pages.

Non-Final Office Action dated Jun. 3, 2019, issued in connection with U.S. Appl. No. 13/904,909, filed May 29, 2013, 16 pages.

Non-Final Office Action dated Dec. 30, 2014, issued in connection with U.S. Appl. No. 14/520,566, filed Oct. 22, 2014, 10 pages.

Non-Final Office Action dated Oct. 30, 2018, issued in connection with U.S. Appl. No. 14/956,640, filed Dec. 2, 2015, 11 pages.

Non-Final Office Action dated Mar. 7, 2019, issued in connection with U.S. Appl. No. 15/872,500, filed Jan. 16, 2018, 12 pages.

Notice of Allowance dated Oct. 9, 2015, issued in connection with U.S. Appl. No. 13/864,086, filed Apr. 16, 2013, 14 pages.

Notice of Allowance dated Jun. 6, 2016, issued in connection with U.S. Appl. No. 13/904,944, filed May 29, 2013, 5 pages.

Notice of Allowance dated Nov. 7, 2016, issued in connection with U.S. Appl. No. 14/520,578, filed Oct. 22, 2014, 14 pages.

Notice of Allowance dated Mar. 9, 2017, issued in connection with U.S. Appl. No. 13/904,949, filed May 29, 2013, 13 pages.

Notice of Allowance dated Jun. 13, 2016, issued in connection with U.S. Appl. No. 13/864,075, filed Apr. 16, 2013, 11 pages.

Notice of Allowance dated May 16, 2018, issued in connection with U.S. Appl. No. 15/263,069, filed Sep. 12, 2016, 5 pages.

Notice of Allowance dated Oct. 28, 2019, issued in connection with U.S. Appl. No. 16/551,070, filed Aug. 26, 2019, 8 pages.

Sonos, Inc. v. Lenbrook Industries Limited et al., Defendants' First Amended Answer and Counterclaims to Plaintiff's Complaint, filed Nov. 14, 2019, 66 pages.

US 10,779,033 B2

Page 8

(56)

References Cited

OTHER PUBLICATIONS

Australian Patent Office, Australian Examination Report Action dated Jul. 3, 2019, issued in connection with Australian Application No. 2018203185, 3 pages.

European Patent Office, European Search Report dated Jul. 22, 2019, issued in connection with European Application No. 19178151.7, 7 pages.

European Patent Office, Summons to Attend Oral Proceedings mailed on Jul. 12, 2019, issued in connection with European Application No. 14785247.9, 12 pages.

Notice of Allowance dated Sep. 20, 2019, issued in connection with U.S. Appl. No. 15/872,500, filed Jan. 16, 2018, 7 pages.

Sonos, Inc. v. Implicit, LLC: Declaration of Roman Chertov in Support of the Inter Partes Review of U.S. Pat. No. 7,391,791 dated Mar. 9, 2018, 92 pages.

Sonos, Inc. v. Implicit, LLC: Declaration of Roman Chertov in Support of the Inter Partes Review of U.S. Pat. No. 8,942,252 dated Mar. 9, 2018, 81 pages.

Sonos, Inc. v. Lenbrook Industries Limited et al., Defendants' Answer to Plaintiff's Complaint—Exhibit A, filed Oct. 14, 2019, 3 pages.

Sonos, Inc. v. Lenbrook Industries Limited et al., Defendants' Answer to Plaintiff's Complaint—Exhibit C, filed Oct. 14, 2019, 16 pages.

Sofas, Inc. v. Lenbrook Industries Limited et al., Defendants' Answer to Plaintiff's Complaint—Exhibit D, filed Oct. 14, 2019, 36 pages.

Sonos, Inc. v. Lenbrook Industries Limited et al., Defendants' Answer to Plaintiff's Complaint—Exhibit E, filed Oct. 14, 2019, 21 pages.

Sonos, Inc. v. Lenbrook Industries Limited et al., Defendants' Answer to Plaintiff's Complaint, filed Oct. 14, 2019, 66 pages.

Chinese Patent Office, First Office Action and Translation dated Nov. 25, 2019, issued in connection with Chinese Application No. 201810042292.3, 13 pages.

Final Office Action dated Dec. 12, 2019, issued in connection with U.S. Appl. No. 13/904,909, filed May 29, 2013, 21 pages.

Notice of Allowance dated Dec. 16, 2019, issued in connection with U.S. Appl. No. 15/872,500, filed Jan. 16, 2018, 7 pages.

Australian Patent Office, Australian Examination Report Action dated Jan. 31, 2020, issued in connection with Australian Application No. 2018203185, 4 pages.

Barix Download Exstreamer Software. Accessed via WayBack Machine, Apr. 6, 2003. <http://www.barix.com/exstreamer/software.download.html>. 2 pages.

Barix. Exstreamer Datasheet. Accessed via WayBack Machine, Apr. 2, 2003. <http://www.barix.com/exstreamer/>, 1 page.

Canadian Patent Office, Canadian Office Action dated Dec. 10, 2019, issued in connection with Canadian Application No. 2861790, 5 pages.

European Patent Office, Decision to Refuse European Patent Application dated Dec. 20, 2019, issued in connection with European Application No. 14785247.9, 25 pages.

European Patent Office, European Extended Search Report dated May 7, 2020, issued in connection with European Application No. 20159841.4, 16 pages.

European Patent Office, European Office Action dated May 25, 2020, issued in connection with European Application No. 19178151.7, 4 pages.

Exstreamer. Network MP3 player for digital audio streaming in a consumer, home installation and commercial applications. Barix Think Further. Sep. 2002, 2 pages.

Exstreamer. The Exstreamer Instruction Manual. Barix Think Further. Version 1.5, Oct. 2002, 21 pages.

Exstreamer. The Exstreamer Technical Description: Version 1.5. Barix Think Further. Oct. 2002, 36 pages.

Non-Final Office Action dated Dec. 26, 2019, issued in connection with U.S. Appl. No. 16/550,148, filed on Aug. 23, 2019, 20 pages.

Notice of Allowance dated May 21, 2020, issued in connection with U.S. Appl. No. 16/550,148, filed on Aug. 23, 2019, 7 pages.

Notice of Allowance dated Mar. 3, 2020, issued in connection with U.S. Appl. No. 13/904,909, filed on May 29, 2013, 11 pages.

Yahoo Groups. Exstreamer. Barix Exstreamer. Access via Wayback Machine <http://groups.yahoo.com/group/exstreamer/> Dec. 22, 2013, 1 page.

Yamaha DME Designer 3.0 Owner's Manual; Copyright 2008, 501 pages.

* cited by examiner

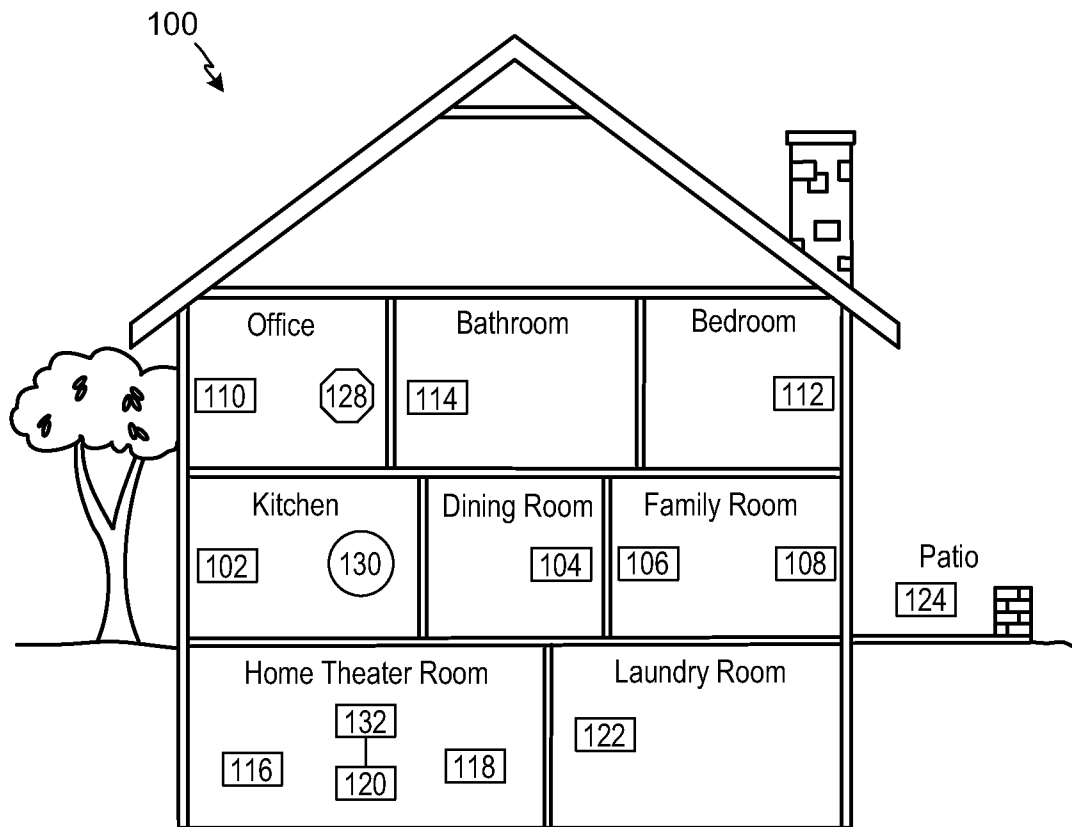


FIGURE 1

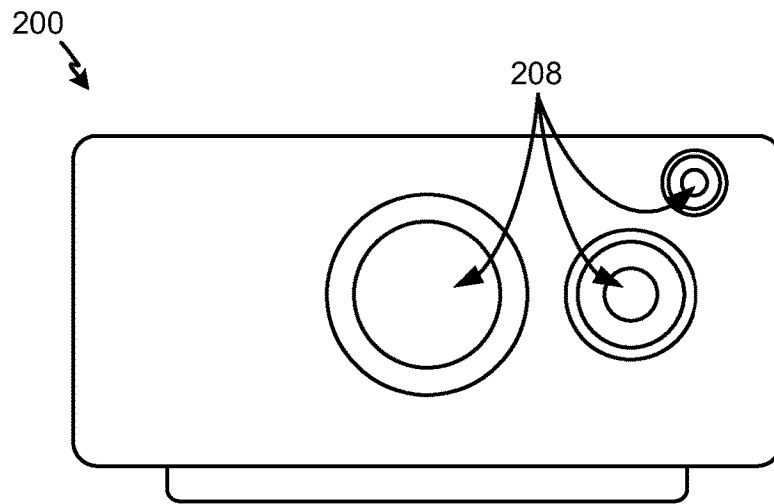


FIGURE 2A

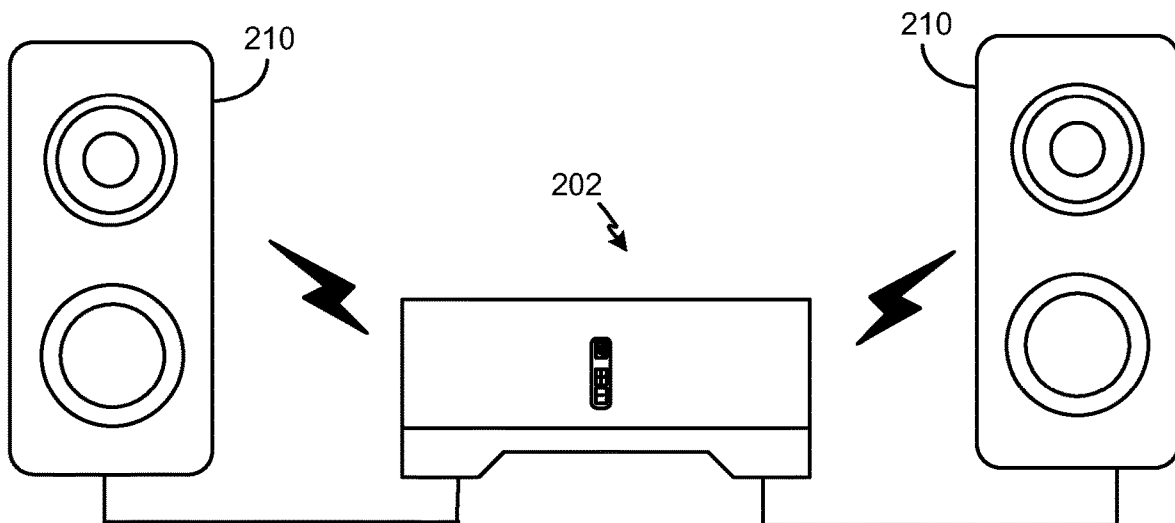


FIGURE 2B

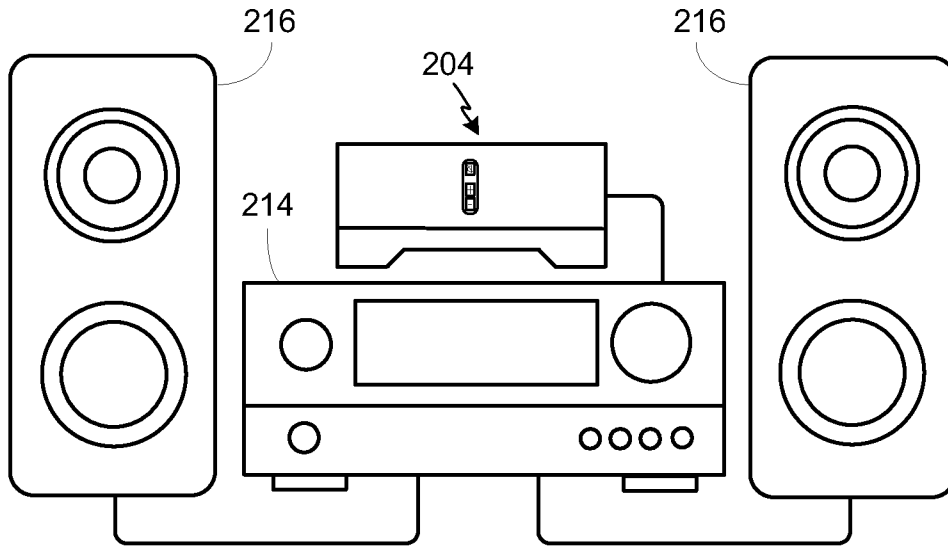


FIGURE 2C

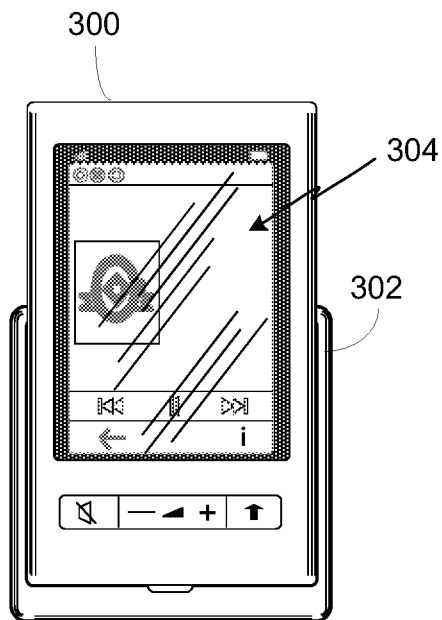


FIGURE 3

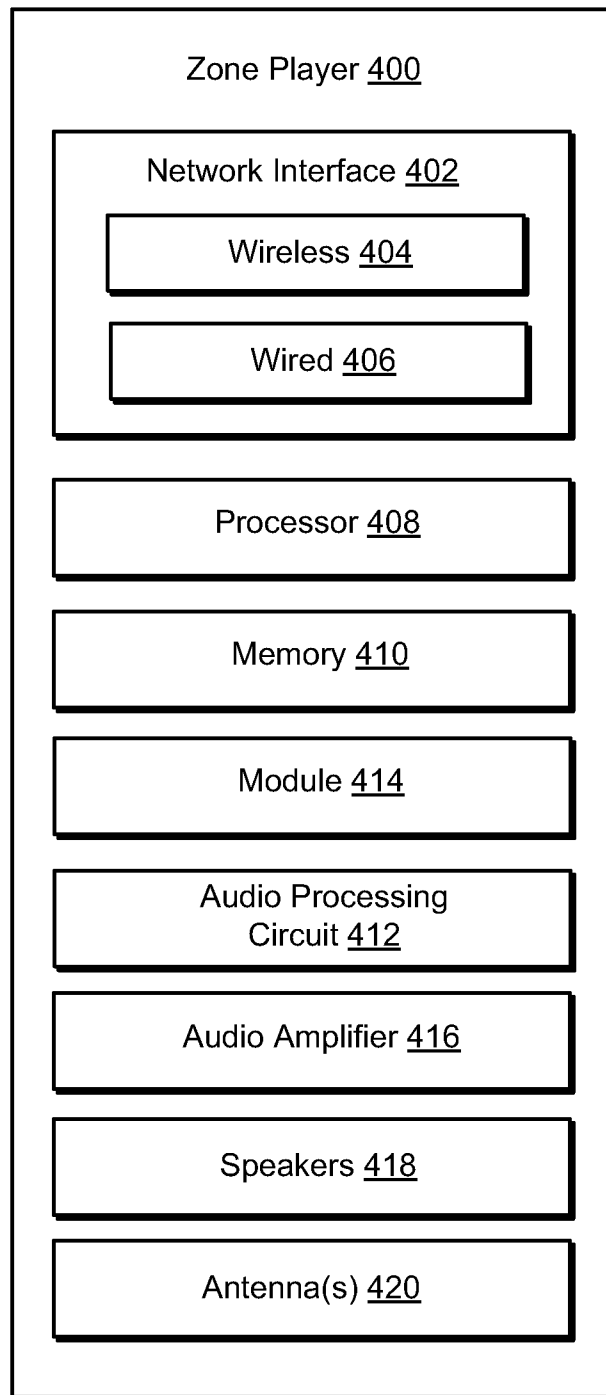


FIGURE 4

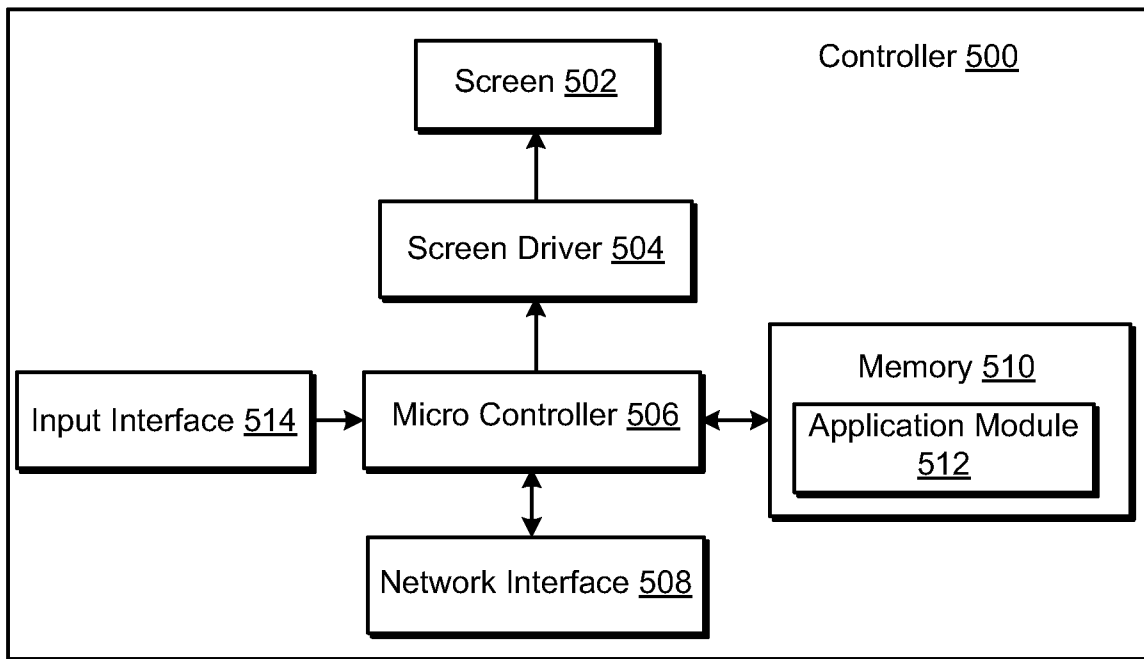


FIGURE 5

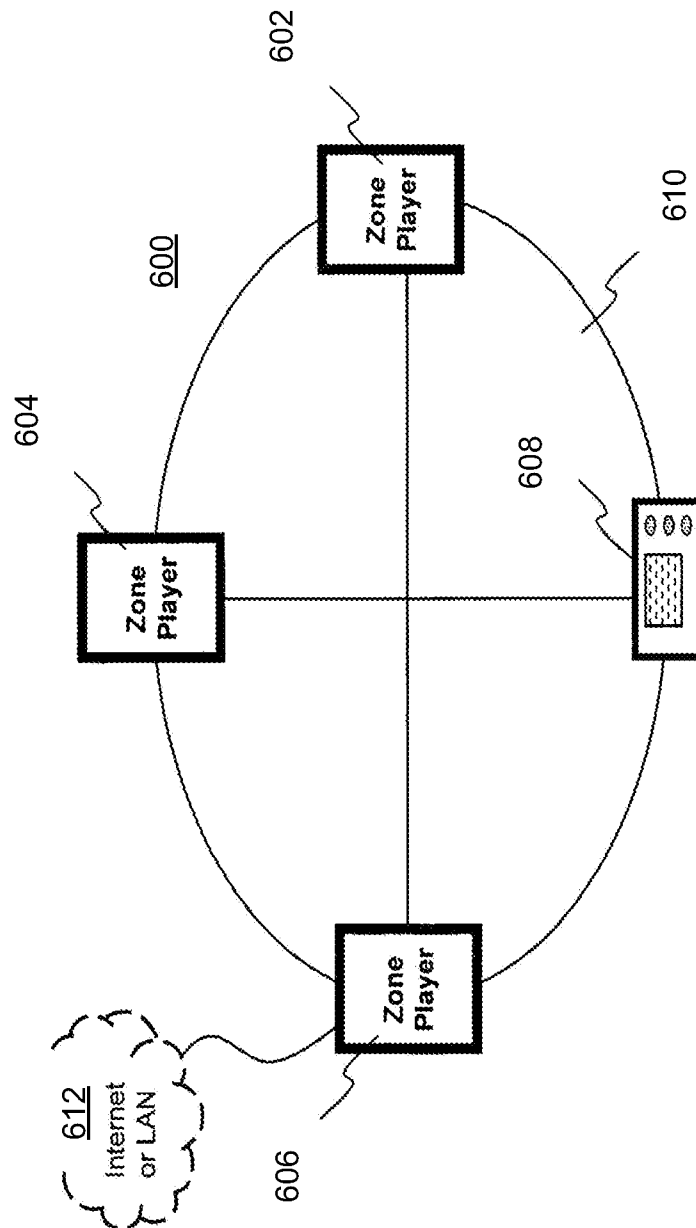
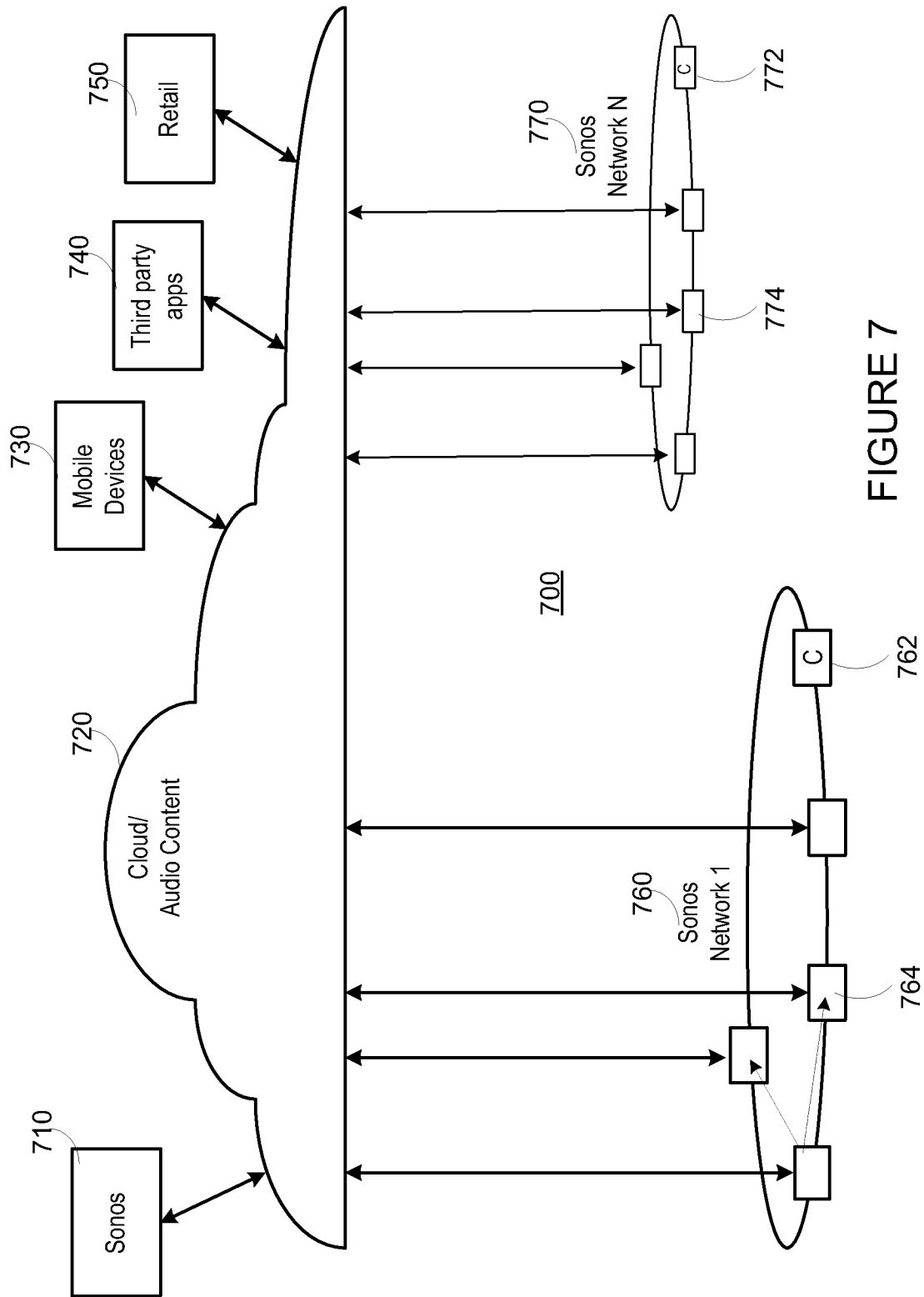


FIGURE 6



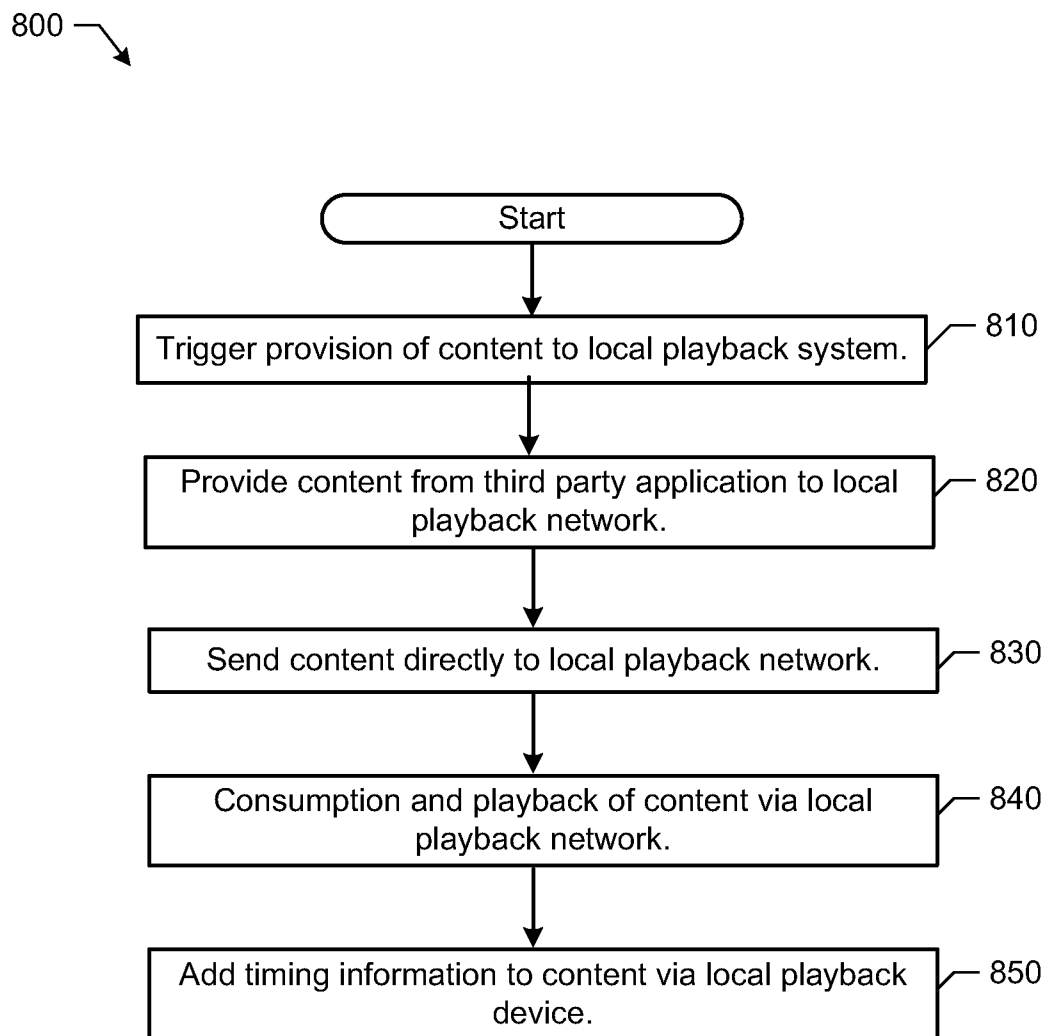


FIGURE 8

900 ↘

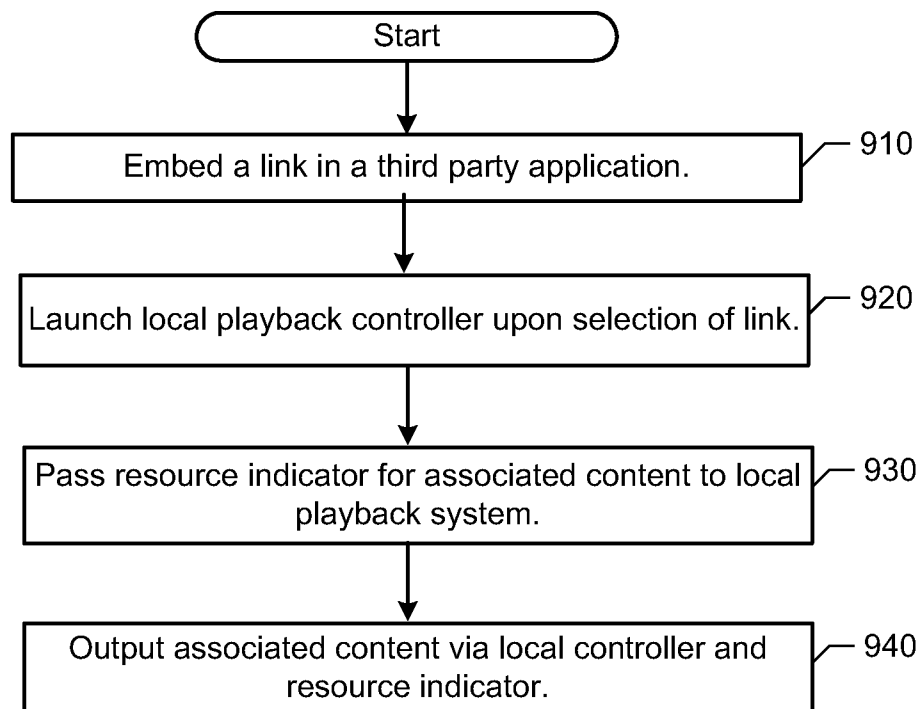


FIGURE 9

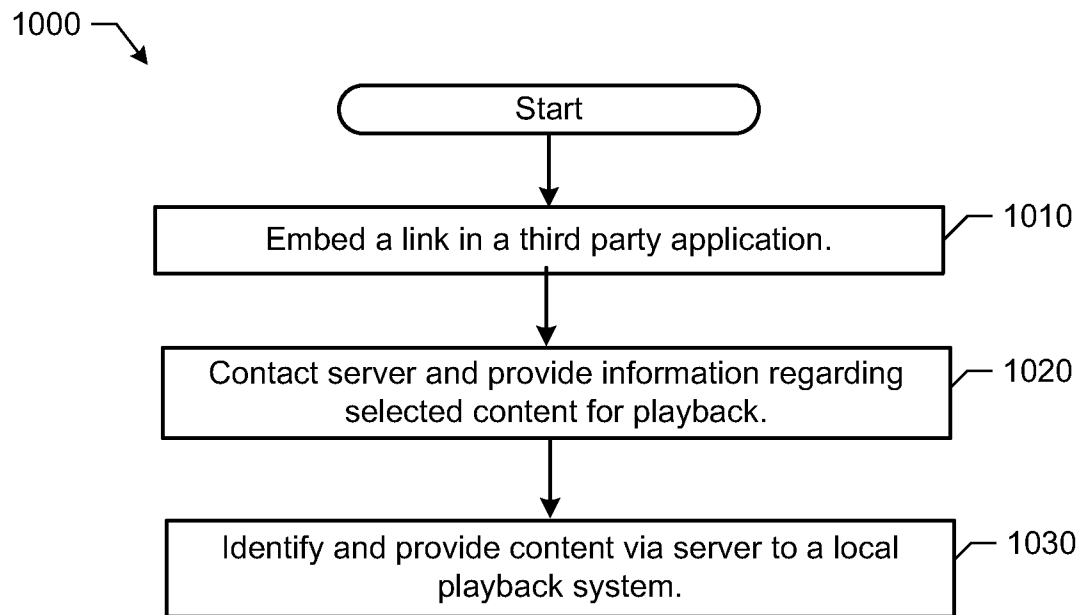


FIGURE 10

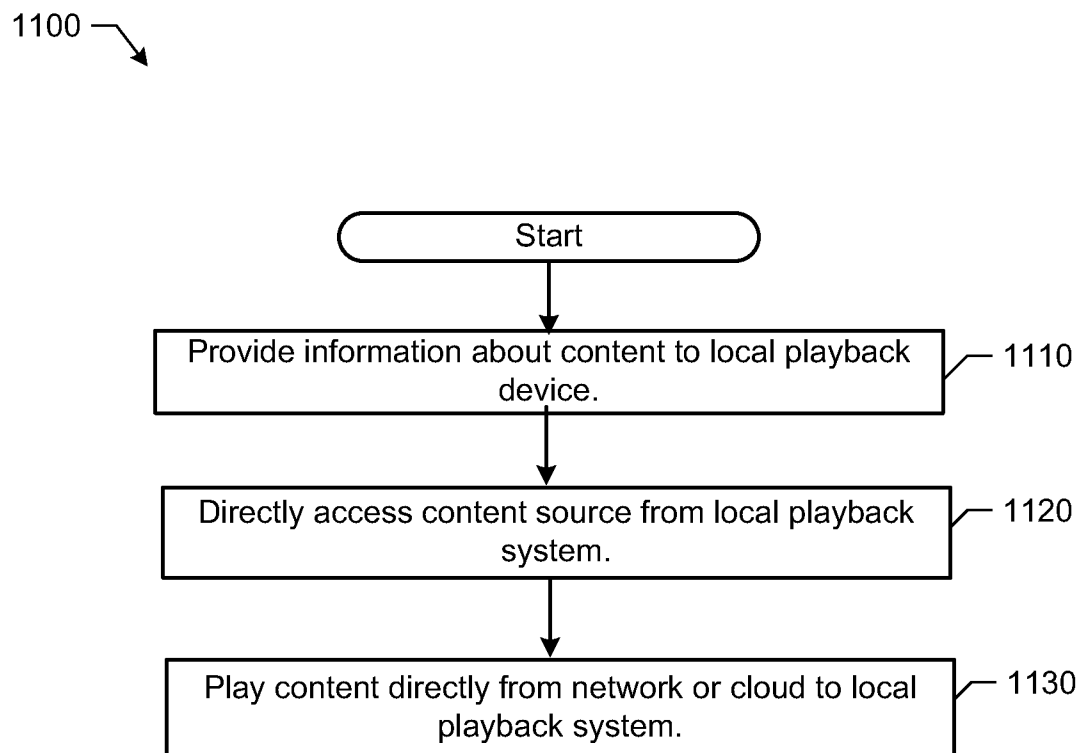


FIGURE 11

US 10,779,033 B2

1

**SYSTEMS AND METHODS FOR
NETWORKED MUSIC PLAYBACK****CROSS REFERENCE TO RELATED
APPLICATIONS**

This application is a continuation of U.S. non-provisional patent application Ser. No. 15/872,500, filed on Jan. 16, 2018, entitled "Systems and Methods for Networked Music Playback," which is a continuation of U.S. non-provisional patent application Ser. No. 14/520,578, filed on Oct. 22, 2014, entitled "Systems and Methods for Networked Music Playback," which is a continuation of U.S. non-provisional patent application Ser. No. 13/341,237, filed on Dec. 30, 2011, entitled "Systems and Methods for Networked Music Playback," all of which are incorporated herein by reference in their entirety.

FIELD OF THE DISCLOSURE

The disclosure is related to consumer electronics and, more particularly, to providing music for playback via one or more devices on a playback data network.

BACKGROUND

Technological advancements have increased the accessibility of music content, as well as other types of media, such as television content, movies, and interactive content. For example, a user can access audio, video, or both audio and video content over the Internet through an online store, an Internet radio station, an online music service, an online movie service, and the like, in addition to the more traditional avenues of accessing audio and video content. Demand for such audio and video content continues to surge. Given the high demand, technology used to access and play such content has likewise improved.

BRIEF DESCRIPTION OF THE DRAWINGS

Features, aspects, and advantages of the presently disclosed technology are better understood with regard to the following description, appended claims, and accompanying drawings where:

FIG. 1 shows an illustration of an example system in which embodiments of the methods and apparatus disclosed herein can be implemented;

FIG. 2A shows an illustration of an example zone player having a built-in amplifier and speakers;

FIG. 2B shows an illustration of an example zone player having a built-in amplifier and connected to external speakers;

FIG. 2C shows an illustration of an example zone player connected to an A/V receiver and speakers;

FIG. 3 shows an illustration of an example controller;

FIG. 4 shows an internal functional block diagram of an example zone player;

FIG. 5 shows an internal functional block diagram of an example controller;

FIG. 6 shows an example ad-hoc playback network;

FIG. 7 shows a system including a plurality of networks including a cloud-based network and at least one local playback network; and

FIGS. 8-11 show flow diagrams for methods to provide audio content to a local playback system.

2

In addition, the drawings are for the purpose of illustrating example embodiments, but it is understood that the present disclosure is not limited to the arrangements and instrumentality shown in the drawings.

DETAILED DESCRIPTION**I. Overview**

Wired or wireless networks can be used to connect one or more multimedia playback devices for a home or other location playback network (e.g., a home music system). Certain examples provide automatic configuration of parameters of a playback device to be coupled to a network with reduced or minimum human intervention. For example, a wired and/or wireless ad-hoc network is established to facilitate communications among a group of devices. Music and/or other multimedia content can be shared among devices and/or groups of devices (also referred to herein as zones) associated with a playback network.

Certain embodiments facilitate streaming or otherwise providing music from a music-playing application (e.g., browser-based application, native music player, other multimedia application, and so on) to a multimedia content playback (e.g., Sonos™) system. Certain embodiments provide simple, easy-to-use and secure systems and methods for multimedia content playback across a plurality of systems and locations. Certain embodiments facilitate integration between content partners and a playback system as well as supporting maintenance of such content and system.

Although the following discloses example systems, methods, apparatus, and articles of manufacture including, among other components, firmware and/or software executed on hardware, it should be noted that such systems, methods, apparatus, and/or articles of manufacture are merely illustrative and should not be considered as limiting. For example, it is contemplated that any or all of these firmware, hardware, and/or software components could be embodied exclusively in hardware, exclusively in software, exclusively in firmware, or in any combination of hardware, software, and/or firmware. Accordingly, while the following describes example systems, methods, apparatus, and/or articles of manufacture, the examples provided are not the only way(s) to implement such systems, methods, apparatus, and/or articles of manufacture.

When any of the appended claims are read to cover a purely software and/or firmware implementation, at least one of the elements in at least one example is hereby expressly defined to include a tangible medium such as a memory, DVD, CD, Blu-ray, and so on, storing the software and/or firmware.

Reference herein to "embodiment" means that a particular feature, structure, or characteristic described in connection with the embodiment can be included in at least one example embodiment of the invention. The appearances of this phrase in various places in the specification are not necessarily all referring to the same embodiment, nor are separate or alternative embodiments mutually exclusive of other embodiments. As such, the embodiments described herein, explicitly and implicitly understood by one skilled in the art, can be combined with other embodiments.

Certain embodiments provide a method to provide content to a local playback network. The example method includes identifying multimedia content from a content provider. The example method includes passing information regarding the multimedia content to a local playback system including one or more multimedia playback devices in response to a trigger. The example method includes facilitating play of the

US 10,779,033 B2

3

multimedia content via a local playback network associated with the local playback system.

Certain embodiments provide a computer readable storage medium including instructions for execution by a processor, the instructions, when executed, cause the processor to implement a method to provide content to a local playback network. The example method includes identifying multimedia content from a content provider. The example method includes passing information regarding the multimedia content to a local playback system including one or more multimedia playback devices in response to a trigger. The example method includes facilitating play of the multimedia content via a local playback network associated with the local playback system.

Certain embodiments provide a multimedia playback device including a wireless communication interface to communicate with a local playback network and a multimedia content source and a processor. The process is to identify multimedia content from the multimedia content source; pass information regarding the multimedia content to device on the local playback network in response to a trigger; and facilitate play of the multimedia content via the devices on the local playback network.

II. Example Environment

Referring now to the drawings, in which like numerals can refer to like parts throughout the figures, FIG. 1 shows an example system configuration **100** in which one or more of the method and/or apparatus disclosed herein can be practiced or implemented. By way of illustration, the system configuration **100** represents a home with multiple zones. Each zone, for example, represents a different room or space, such as an office, bathroom, bedroom, kitchen, dining room, family room, home theater room, utility or laundry room, and patio. While not shown here, a single zone can cover more than one room or space. One or more of zone players **102-124** are shown in each respective zone. A zone player **102-124**, also referred to as a playback device, multimedia unit, speaker, and so on, provides audio, video, and/or audiovisual output. A controller **130** (e.g., shown in the kitchen for purposes of illustration) provides control to the system configuration **100**. The system configuration **100** illustrates an example whole house audio system, though it is understood that the technology described herein is not limited to its particular place of application or to an expansive system like a whole house audio system **100** of FIG. 1.

FIGS. 2A, 2B, and 2C show example illustrations of zone players **200-204**. The zone players **200-204** of FIGS. 2A, 2B, and 2C, respectively, can correspond to any of the zone players **102-124** of FIG. 1. While certain embodiments provide multiple zone players, an audio output can be generated using only a single zone player. FIG. 2A illustrates a zone player **200** including sound producing equipment **208** capable of generating sound or an audio output corresponding to a signal received (e.g., wirelessly and/or via a wired interface). The sound producing equipment **208** of the zone player **200** of FIG. 2A includes a built-in amplifier (not shown in this illustration) and speakers (e.g., a tweeter, a mid-range driver, and/or a subwoofer). In certain embodiments, the zone player **200** of FIG. 2A can be configured to play stereophonic audio or monaural audio. In some embodiments, the zone player **200** of FIG. 2A can be configured as a component in a combination of zone players to play stereophonic audio, monaural audio, and/or surround audio. As described in greater detail below, in some embodiments, the example zone player **200** of FIG. 2A can also transmit a second signal to, for example, other zone player(s) in the same or different zone(s), speaker(s), receiver(s), and so on.

4

er(s), and so on. Transmission of the second signal can be part of, for example, a system in which multiple zone players, speakers, receivers, and so on, form a network to, for example, present media content in a synchronization or distributed manner.

The example zone player **202** of FIG. 2B includes a built-in amplifier (not shown in this illustration) to power a set of detached speakers **210**. The speakers **210** of FIG. 2B can include, for example, any type of loudspeaker. The zone player **202** of FIG. 2B can communicate a signal corresponding to audio content to the detached speakers **210** via wired and/or wireless channels. Instead of receiving and generating audio content as in FIG. 2A, the zone player **202** of FIG. 2B receives the audio content and transmits the same (e.g., after processing the received signal) to the detached speakers **210**. Similar to the example zone player **200** of FIG. 2A, in some embodiments the zone player **202** can transmit a second signal to, for example, other zone player(s) in the same or different zone(s), speaker(s), receiver(s), and so on.

The example zone player **204** of FIG. 2C does not include an amplifier, but allows a receiver **214**, or another audio and/or video type device with built-in amplification, to connect to a data network **128** of FIG. 1 and to play audio received over the data network **128** via the receiver **214** and a set of detached speakers **216**. In addition to the wired couplings shown in FIG. 2C, the detached speakers **216** can receive audio content via a wireless communication channel between the detached speakers **216** and, for example, the zone player **204** and/or the receiver **214**. In some embodiments the zone player **202** can transmit a second signal to, for example, other zone player(s) in the same or different zone(s), speaker(s), receiver(s), and so on.

Example zone players include a “Sonos® S5,” “Sonos Play:5,” “Sonos Play:3,” “ZonePlayer 120,” and “ZonePlayer 90,” which are offered by Sonos, Inc. of Santa Barbara, Calif. Any other past, present, and/or future zone players can additionally or alternatively be used to implement the zone players of example embodiments disclosed herein. A zone player can also be referred to herein as a playback device, and a zone player is not limited to the particular examples illustrated in FIGS. 2A, 2B, and 2C. For example, a zone player can include a wired or wireless headphone. In other examples, a zone player might include a subwoofer. In yet other examples, a zone player can include a sound bar. In an example, a zone player can include or interact with a docking station for an Apple iPod™ or similar device. In some embodiments, a zone player can relay one or more signals received from, for example, a first zone player to another playback device. In some embodiments, a zone player can receive a first signal and generate an output corresponding to the first signal and, simultaneously or separately, can receive a second signal and transmit or relay the second signal to another zone player(s), speaker(s), receiver(s), and so on. Thus, an example zone player described herein can act as a playback device and, at the same time, operate as a hub in a network of zone players. In such instances, media content corresponding to the first signal can be different from the media content corresponding to the second signal.

FIG. 3 shows an example illustration of a wireless controller **300** in a docking station **302**. The controller **300** can correspond to the controlling device **130** of FIG. 1. The controller **300** is provided with a touch screen **304** that allows a user to interact with the controller **300**, for example, to retrieve and navigate a playlist of audio items, control operations of one or more zone players, and provide overall

US 10,779,033 B2

5

control of the system configuration **100**. In certain embodiments, any number of controllers can be used to control the system configuration **100**. In certain embodiments, there can be a limit on the number of controllers that can control the system configuration **100**. The controllers might be wireless like wireless controller **300** or wired to the data network **128**. Furthermore, an application running on any network-enabled portable devices, such as an iPhone™, iPad™, Android™ powered phone, or any other smart phone or network-enabled device can be used as a controller by connecting to the data network **128**. An application running on a laptop or desktop PC or Mac can also be used as a controller. Example controllers include a “Sonos® Controller **200**,” “Sonos® Controller for iPhone,” “Sonos® Controller for iPad,” “Sonos® Controller for Android,” “Sonos® Controller for Mac or PC,” which are offered by Sonos, Inc. of Santa Barbara, Calif. The flexibility of such an application and its ability to be ported to a new type of portable device is advantageous.

Referring back to the system configuration **100** of FIG. 1, a particular zone can contain one or more zone players. For example, the family room of FIG. 1 contains two zone players **106** and **108**, while the kitchen is shown with one zone player **102**. Zones can be dynamically configured by positioning a zone player in a room or space and assigning via the controller **130** the zone player to a new or existing zone. As such, zones can be created, combined with another zone, removed, and given a specific name (e.g., “Kitchen”), if so programmed. The zone players **102** to **124** are coupled directly or indirectly to a data network, such as the data network **128** shown in FIG. 1. The data network **128** is represented by an octagon in the figure to stand out from other components shown in the figure. While the data network **128** is shown in a single location, it is understood that such a network can be distributed in and around the system configuration **100**.

Particularly, the data network **128** can be a wired network, a wireless network, or a combination of both. In some embodiments, one or more of the zone players **102-124** are wirelessly coupled to the data network **128** based on a proprietary mesh network. In some embodiments, one or more of the zone players **102-124** are wirelessly coupled to the data network **128** using a non-mesh topology. In some embodiments, one or more of the zone players **102-124** are coupled via a wire to the data network **128** using Ethernet or similar technology. In addition to the one or more zone players **102-124** connecting to the data network **128**, the data network **128** can further allow access to a wide area network, such as the Internet.

In certain embodiments, the data network **128** can be created by connecting any of the zone players **102-124**, or some other connecting device, to a broadband router. Other zone players **102-124** can then be added wired or wirelessly to the data network **128**. For example, a zone player (e.g., any of zone players **102-124**) can be added to the system configuration **100** by simply pressing a button on the zone player itself, which enables a connection to be made to the data network **128**. The broadband router can be connected to an Internet Service Provider (ISP), for example. The broadband router can be used to form another data network within the system configuration **100**, which can be used in other applications (e.g., web surfing). The data network **128** can also be used in other applications, if so programmed. Further, in certain embodiments, the data network **128** is the same network used for other applications in the household.

In certain embodiments, each zone can play from the same audio source as another zone or each zone can play

6

from a different audio source. For example, someone can be grilling on the patio and listening to jazz music via zone player **124**, while someone is preparing food in the kitchen and listening to classical music via zone player **102**. Further, someone can be in the office listening to the same jazz music via zone player **110** that is playing on the patio via zone player **124**. In some embodiments, the jazz music played via zone players **110** and **124** is played in synchrony. Synchronizing playback amongst zones allows for someone to pass through zones while seamlessly listening to the audio. Further, zones can be put into a “party mode” such that all associated zones will play audio in synchrony.

In certain embodiments, a zone contains two or more zone players. For example, the family room contains two zone players **106** and **108**, and the home theater room contains at least zone players **116**, **118**, and **120**. A zone can be configured to contain as many zone players as desired, and for example, the home theater room might contain additional zone players to play audio from a 5.1 channel or greater audio source (e.g., a movie encoded with 5.1 or greater audio channels). If a zone contains two or more zone players, such as the two zone players **106** and **108** in the family room, then the two zone players **106** and **108** can be configured to play the same audio source in synchrony, or the two zone players **106** and **108** can be paired to play two separate sounds in left and right channels, for example. In other words, the stereo effects of a sound can be reproduced or enhanced through the two zone players **106** and **108**, one for the left sound and the other for the right sound. In certain embodiments, paired zone players can play audio in synchrony with other zone players.

In certain embodiments, three or more zone players can be configured to play various channels of audio that is encoded with three channels or more sound. For example, the home theater room shows zone players **116**, **118**, and **120**. If the sound is encoded as 2.1 channel audio, then the zone player **116** can be configured to play left channel audio, the zone player **118** can be configured to play right channel audio, and the zone player **120** can be configured to play bass frequencies. Other configurations are possible and depend on the number of zone players and the type of audio. Further, a particular zone can be configured to play a 5.1 channel audio in one instance, such as when playing audio from a movie, and then dynamically switch to play stereo, such as when playing audio from a two channel source.

In certain embodiments, two or more zone players can be sonically consolidated to form a single, consolidated zone player. A consolidated zone player (though made up of multiple, separate devices) can be configured to process and reproduce sound differently than an unconsolidated zone player or zone players that are paired, because a consolidated zone player will have additional speaker drivers from which sound can be passed. The consolidated zone player can further be paired with a single zone player or yet another consolidated zone player. Each playback device of a consolidated playback device is preferably set in a consolidated mode.

According to some embodiments, one can continue to do any of: group, consolidate, and pair zone players, for example, until a desired configuration is complete. The actions of grouping, consolidation, and pairing are preferably performed through a control interface, such as using controller **130**, and not by physically connecting and re-connecting speaker wire, for example, to individual, discrete speakers to create different configurations. As such, certain

US 10,779,033 B2

7

embodiments described herein provide a more flexible and dynamic platform through which sound reproduction can be offered to the end-user.

Sources of audio content to be played by zone players **102-124** are numerous. Music from a personal library stored on a computer or networked-attached storage (NAS) can be accessed via the data network **128** and played. Internet radio stations, shows, and podcasts can be accessed via the data network **128**. Music services that let a user stream and download music and audio content can be accessed via the data network **128**. Further, music can be obtained from traditional sources, such as a turntable or CD player, via a line-in connection to a zone player, for example. Audio content can also be accessed through AirPlay™ wireless technology by Apple, Inc., for example. Audio content received from one or more sources can be shared amongst the zone players **102** to **124** via the data network **128** and/or the controller **130**. The above-disclosed sources of audio content are referred to herein as network-based audio information sources. However, network-based audio information sources are not limited thereto.

The example home theater zone players **116**, **118**, **120** are coupled to an audio information source such as a television **132**. In some examples, the television **132** is used as a source of audio for the home theater zone players **116**, **118**, **120**, while in other examples audio information from the television **132** can be shared with any of the zone players **102-124** in the audio system **100**.

III. Example Playback Device

Referring now to FIG. 4, there is shown an example functional block diagram of a zone player **400** in accordance with an embodiment. The zone player **400** of FIG. 4 includes a network interface **402**, a processor **408**, a memory **410**, an audio processing component **412**, a module **414**, an audio amplifier **416**, and a speaker unit **418** coupled to the audio amplifier **416**. FIG. 2A shows an example illustration of such a zone player. Other types of zone players can not include the speaker unit **418** (e.g., such as shown in FIG. 2B) or the audio amplifier **416** (e.g., such as shown in FIG. 2C). Further, it is contemplated that the zone player **400** can be integrated into another component. For example, the zone player **400** could be constructed as part of a lamp for indoor or outdoor use.

Referring back to FIG. 4, the network interface **402** facilitates a data flow between zone players and other devices on a data network (e.g., the data network **128** of FIG. 1) and the zone player **400**. In some embodiments, the network interface **402** can manage the assembling of an audio source or file into smaller packets that are to be transmitted over the data network or reassembles received packets into the original source or file. In some embodiments, the network interface **402** can further handle the address part of each packet so that it gets to the right destination or intercepts packets destined for the zone player **400**. Accordingly, in certain embodiments, each of the packets includes an Internet Protocol (IP)-based source address as well as an IP-based destination address.

In some embodiments, the network interface **402** can include one or both of a wireless interface **404** and a wired interface **406**. The wireless interface **404**, also referred to as an RF interface, provides network interface functions for the zone player **400** to wirelessly communicate with other devices (e.g., other zone player(s), speaker(s), receiver(s), component(s) associated with the data network **128**, and so on) in accordance with a communication protocol (e.g., any of the wireless standards IEEE 802.11a, 802.11b, 802.11g, 802.11n, or 802.15). To receive wireless signals and to

8

provide the wireless signals to the wireless interface **404** and to transmit wireless signals, the zone player **400** of FIG. 4 includes one or more antennas **420**. The wired interface **406** provides network interface functions for the zone player **400** to communicate over a wire with other devices in accordance with a communication protocol (e.g., IEEE 802.3). In some embodiments, a zone player includes both of the interfaces **404** and **406**. In some embodiments, a zone player **400** includes only the wireless interface **404** or the wired interface **406**.

In some embodiments, the processor **408** is a clock-driven electronic device that is configured to process input data according to instructions stored in memory **410**. The memory **410** is data storage that can be loaded with one or more software modules **414**, which can be executed by the processor **408** to achieve certain tasks. In the illustrated embodiment, the memory **410** is a tangible machine readable medium storing instructions that can be executed by the processor **408**. In some embodiments, a task might be for the zone player **400** to retrieve audio data from another zone player or a device on a network. In some embodiments, a task might be for the zone player **400** to send audio data to another zone player or device on a network. In some embodiments, a task might be for the zone player **400** to synchronize playback of audio with one or more additional zone players. In some embodiments, a task might be to pair the zone player **400** with one or more zone players to create a multi-channel audio environment. Additional or alternative tasks can be achieved via the one or more software modules **414** and the processor **408**.

The audio processing component **412** can include one or more digital-to-analog converters (DAC), an audio preprocessing component, an audio enhancement component or a digital signal processor, and so on. In certain embodiments, the audio that is retrieved via the network interface **402** is processed and/or intentionally altered by the audio processing component **412**. Further, the audio processing component **412** can produce analog audio signals. The processed analog audio signals are then provided to the audio amplifier **416** for play back through speakers **418**. In addition, the audio processing component **412** can include necessary circuitry to process analog or digital signals as inputs to play from zone player **400**, send to another zone player on a network, or both play and send to another zone player on the network. An example input includes a line-in connection (e.g., an auto-detecting 3.5 mm audio line-in connection).

The audio amplifier **416** is a device that amplifies audio signals to a level for driving one or more speakers **418**. The one or more speakers **418** can include an individual transducer (e.g., a “driver”) or a complete speaker system that includes an enclosure including one or more drivers. A particular driver can be a subwoofer (for low frequencies), a mid-range driver (middle frequencies), and a tweeter (high frequencies), for example. An enclosure can be sealed or ported, for example.

A zone player **400** can also be referred to herein as a playback device. An example playback device includes a Sonos® Play:5, which is manufactured by Sonos, Inc. of Santa Barbara, Calif. The Play:5 is an example zone player with a built-in amplifier and speakers. In particular, the Play:5 is a five-driver speaker system that includes two tweeters, two mid-range drivers, and one subwoofer. When playing audio content via the Play:5, the left audio data of a track is sent out of the left tweeter and left mid-range driver, the right audio data of a track is sent out of the right tweeter and the right mid-range driver, and mono bass is sent out of the subwoofer. Further, both mid-range drivers and

both tweeters have the same equalization (or substantially the same equalization). That is, they are both sent the same frequencies, just from different channels of audio. Audio from Internet radio stations, online music and video services, downloaded music, analog audio inputs, television, DVD, and so on, can be played from a Sonos® Play:5. While the Play:5 is an example of a zone player with speakers, it is understood that a zone player with speakers is not limited to one with a certain number of speakers (e.g., five speakers as in the Play:5), but rather can contain one or more speakers. Further, a zone player can be part of another device, which might even serve a purpose different than audio (e.g., a lamp).

IV. Example Controller

Referring now to FIG. 5, there is shown an example controller 500, which can correspond to the controlling device 130 in FIG. 1. The controller 500 can be used to facilitate the control of multi-media applications, automation and others in a system. In particular, the controller 500 is configured to facilitate a selection of a plurality of audio sources available on the network and enable control of one or more zone players (e.g., the zone players 102-124 in FIG. 1) through a wireless network interface 508. According to one embodiment, the wireless communications is based on an industry standard (e.g., infrared, radio, wireless standards IEEE 802.11a, 802.11b 802.11g, 802.11n, or 802.15). Further, when a particular audio is being accessed via the controller 500 or being played via a zone player, a picture (e.g., album art) or any other data, associated with the audio source can be transmitted from a zone player or other electronic device to the controller 500 for display.

The controller 500 is provided with a screen 502 and an input interface 514 that allows a user to interact with the controller 500, for example, to navigate a playlist of many multimedia items and to control operations of one or more zone players. The screen 502 on the controller 500 can be an LCD screen, for example. The screen 500 communicates with and is commanded by a screen driver 504 that is controlled by a microcontroller (e.g., a processor) 506. The memory 510 can be loaded with one or more application modules 512 that can be executed by the microcontroller 506 with or without a user input via the user interface 514 to achieve certain tasks. In some embodiments, an application module 512 is configured to facilitate grouping a number of selected zone players into a zone group and synchronizing the zone players for audio play back. In some embodiments, an application module 512 is configured to control the audio sounds (e.g., volume) of the zone players in a zone group. In operation, when the microcontroller 506 executes one or more of the application modules 512, the screen driver 504 generates control signals to drive the screen 502 to display an application specific user interface accordingly.

The controller 500 includes a network interface 508 that facilitates wireless communication with a zone player. In some embodiments, the commands such as volume control and audio playback synchronization are sent via the network interface 508. In some embodiments, a saved zone group configuration is transmitted between a zone player and a controller via the network interface 508. The controller 500 can control one or more zone players, such as 102-124 of FIG. 1. There can be more than one controller for a particular system. Further, a controller can be integrated into a zone player.

It should be noted that other network-enabled devices such as an iPhone®, iPad® or any other smart phone or network-enabled device (e.g., a networked computer such as

a PC or Mac®) can also be used as a controller to interact or control zone players in a particular environment. In some embodiments, a software application or upgrade can be downloaded onto a network enabled device to perform the functions described herein.

In certain embodiments, a user can create a zone group including at least two zone players from the controller 500. The zone players in the zone group can play audio in a synchronized fashion, such that all of the zone players in the zone group play back an identical audio source or a list of identical audio sources in a synchronized manner such that no (or substantially no) audible delays or hiccups could be heard. Similarly, in some embodiments, when a user increases the audio volume of the group from the controller 500, the signals or data of increasing the audio volume for the group are sent to one of the zone players and causes other zone players in the group to be increased together in volume.

A user via the controller 500 can group zone players into a zone group by activating a “Link Zones” or “Add Zone” soft button, or de-grouping a zone group by activating an “Unlink Zones” or “Drop Zone” button. For example, one mechanism for ‘joining’ zone players together for audio play back is to link a number of zone players together to form a group. To link a number of zone players together, a user can manually link each zone player or room one after the other. For example, assume that there is a multi-zone system that includes the following zones: Bathroom, Bedroom, Den, Dining Room, Family Room, and Foyer.

In certain embodiments, a user can link any number of the six zone players, for example, by starting with a single zone and then manually linking each zone to that zone.

In certain embodiments, a set of zones can be dynamically linked together using a command to create a zone scene or theme (subsequent to first creating the zone scene). For instance, a “Morning” zone scene command can link the Bedroom, Office, and Kitchen zones together in one action. Without this single command, the user would need to manually and individually link each zone. The single command might include a mouse click, a double mouse click, a button press, a gesture, or some other programmed action. Other kinds of zone scenes can be programmed.

In certain embodiments, a zone scene can be triggered based on time (e.g., an alarm clock function). For instance, a zone scene can be set to apply at 8:00 am. The system can link appropriate zones automatically, set specific music to play, and then stop the music after a defined duration. Although any particular zone can be triggered to an “On” or “Off” state based on time, for example, a zone scene enables any zone(s) linked to the scene to play a predefined audio (e.g., a favorable song, a predefined playlist) at a specific time and/or for a specific duration. If, for any reason, the scheduled music failed to be played (e.g., an empty playlist, no connection to a share, failed Universal Plug and Play (UPnP), no Internet connection for an Internet Radio station, and so on), a backup buzzer can be programmed to sound. The buzzer can include a sound file that is stored in a zone player, for example.

V. Example Ad-Hoc Network

Certain particular examples will now be provided in connection with FIGS. 6-8B to describe, for purposes of illustration only, certain base systems and methods to provide and facilitate connection to a playback network. FIG. 6 shows that there are three zone players 602, 604 and 606 and a controller 608 that form a network branch that is also referred to as an Ad-Hoc network 610. The network 610 may be wireless, wired, or a combination of wired and wireless. In general, an Ad-Hoc (or “spontaneous”) network is a local

area network or other small network in which there is no one access point for all traffic. With an established Ad-Hoc network **610**, the devices **602**, **604**, **606** and **608** can all communicate with each other in a “peer-to-peer” style of communication, for example. Furthermore, devices may come/and go from the network **610**, and the network **610** will automatically reconfigure itself without needing the user to reconfigure the network **610**.

Using the Ad-Hoc network **610**, the devices **602**, **604**, **606**, and **608** can share or exchange one or more audio sources and be grouped to play the same or different audio sources. For example, the devices **602** and **604** are grouped to playback one piece of music, and at the same time, the device **606** plays back another piece of music. In other words, the devices **602**, **604**, **606** and **608**, as shown in FIG. **6**, form a HOUSEHOLD that distributes audio and/or reproduces sound. As used herein, the term HOUSEHOLD (provided in uppercase letters to disambiguate from the user’s domicile) is used to represent a collection of networked devices that are cooperating to provide an application or service. An instance of a HOUSEHOLD is identified with a household **10** (or household identifier).

In certain embodiments, a household identifier (HHID) is a short string or an identifier that is computer-generated to help ensure that it is unique. Accordingly, the network **610** can be characterized by a unique HHID and a unique set of configuration variables or parameters, such as channels (e.g., respective frequency bands), SSID (a sequence of alphanumeric characters as a name of a wireless network), and WEP keys (wired equivalent privacy or other security keys). In certain embodiments, SSID is set to be the same as HHID.

In certain embodiments, each HOUSEHOLD includes two types of network nodes: a control point (CP) and a zone player (ZP). The control point controls an overall network setup process and sequencing, including an automatic generation of required network parameters (e.g., WEP keys). In an embodiment, the CP also provides the user with a HOUSEHOLD configuration user interface. The CP function can be provided by a computer running a CP application module, or by a handheld controller (e.g., the controller **308**) also running a CP application module, for example. The zone player is any other device on the network that is placed to participate in the automatic configuration process. The ZP, as a notation used herein, includes the controller **308** or a computing device, for example.

In certain embodiments, configuration of a HOUSEHOLD involves multiple CPs and ZPs that rendezvous and establish a known configuration such that they can use a standard networking protocol (e.g., IP over Wired or Wireless Ethernet) for communication. In an embodiment, two types of networks/protocols are employed: Ethernet 802.3 and Wireless 802.11g. Interconnections between a CP and a ZP can use either of the networks/protocols. A device in the system as a member of a HOUSEHOLD can connect to both networks simultaneously. In an environment that has both networks in use, it is assumed that at least one device in a system is connected to both as a bridging device, thus providing bridging services between wired/wireless networks for others. The zone player **606** in FIG. **6** is shown to be connected to both networks, for example. The connectivity to the network **612** is based on Ethernet while the connectivity to other devices **602**, **604** and **608** is based on Wireless. It is understood, however, that in some embodiments each zone player **606**, **604**, **602** may access the Internet when retrieving media from the cloud (e.g., Internet) via the bridging device. For example, zone player **602** may contain a uniform resource locator (URL) that specifies

an address to a particular audio track in the cloud. Using the URL, the zone player **602** may retrieve the audio track from the cloud, and ultimately play the audio out of one or more zone players.

VI. Example Music Sharing and Playback Configuration

Certain embodiments enable a user to stream music from a music-playing application (e.g., browser-based application, native music player, other multimedia application, and so on) to a local multimedia content playback (e.g., Sonos™) system. Certain embodiments provide secure systems and methods for multimedia content playback across a plurality of systems and locations. Certain embodiments facilitate integration between content partners and a playback system as well as supporting maintenance of such content and system.

FIG. **7** shows a system including a plurality of networks including a cloud-based network and at least one local playback network. The network includes a plurality of playback devices or players, though it is understood that the network may contain only one playback device. In certain embodiments, each player has an ability to retrieve its content for playback. Control and content retrieval can be distributed or centralized, for example. Input can include streaming content provider input, third party application input, mobile device input, user input, and/or other playback network input into the cloud for local distribution and playback.

As illustrated by the example system **700** of FIG. **7**, a plurality of content providers **720-750** can be connected to one or more local playback networks **760-770** via a cloud and/or other network **710**. Using the cloud **710**, a multimedia playback system **720** (e.g., Sonos™) a mobile device **730**, a third party application **740**, a retail location **750**, and so on can provide multimedia content (requested or otherwise) to local playback networks **760**, **770**. Within each local network **760**, **770**, a controller **762**, **772** and/or playback device **764**, **774** can provide a song identifier, song name, playlist identifier, playlist name, genre, preference, and so on, and/or simply receive content from a connected system via the cloud.

For example, a user listens to a third party music application (e.g., Pandora™ Rhapsody™, Spotify™, and so on) on her smart phone while commuting. She’s enjoying the current channel and, as she walks in the door to her home, selects an option to continue playing that channel on her household music playback system (e.g., Sonos™). The playback system picks up from the same spot on the selected channel that was on her phone and outputs that content (e.g., that song) on speakers and/or other playback devices connected to the household playback system. A uniform resource indicator (URI) (e.g., a uniform resource locator (URL)) can be passed to a playback device to fetch content from a cloud and/or other networked source, for example. A playback device, such as a zone player, can fetch content on its own without use of a controller, for example. Once the zone player has a URL (or some other identification or address) for a song and/or playlist, the zone player can run on its own to fetch the content. Songs and/or other multimedia content can be retrieved from the Internet rather than a local device (e.g., a compact disc (CD)), for example. A third party application can open or utilize an application programming interface (API) to pass music to the household playback system without tight coupling to that household playback system.

In another example of an application determining a playlist and/or other content for playback, a user enjoys listening to music on an online music service (e.g., turntable.fm or

US 10,779,033 B2

13

other virtual room that a user can enter to choose from a plurality of online disc jockeys (DJs) deciding what to play next) using his Mac Book Pro™ at home. He likes the unique user experience the service offers, and he frequently hops from room to room discovering new music. To maximize sound quality, he plays the music on his household playback system (e.g., Sonos™). A button or other indicator can be added to the turntable.fm Web application to switch the content being played to the playback system for output (e.g., to the Sonos™ system rather than or in addition to the Mac Book™). While Web-based applications typically do not have access to items on a local network, certain embodiments enable a third-party Web-based application (e.g., Turntable.fm) to talk to a playback system (e.g., Sonos™) in a certain way (e.g., may have to log in with a username and password), and the identified user has the website send audio or video down to a playback device (e.g., a zone player) on the playback system local network to play music there (or some other media).

In another example, a first user creates a playlist (e.g., a Spotify™ playlist). The first user visits a second user's house, pulls out her smart phone and shares her playlist by playing it on the second user's household playback (e.g., Sonos™) system using her third party (e.g., Spotify™) application. The first user may also go to the third party content provider's (e.g., Spotify's™) website and share her playlist on the second user's playback system.

Thus, certain embodiments provide cross-service linking such that a song identifier can be passed from one user and/or service to another to be fetched and played. A user having a playlist on his or her phone can visit a friend and, using her account on her friend's system, play a song to which she has an access right. A retrieved song can be streamed locally to a user's phone, or an application can pass a song identifier to a local playback system which looks up the song identifier and finds an available audio stream to which the user has a right to play and then plays that song.

In another example, a user is staying in a hotel room or other facility including a local playback network. For example, a speaker and/or other playback device (e.g., a Sonos™ Play:3, Play:5 and so on) in a hotel room can be utilized to play multimedia content to which the user has access from his or her playback network account, streaming audio source, third party application, and so on. Content can be output to one or more devices based on availability, access, configuration, priority, preference, and so on. In certain embodiments, a playback network includes a plurality of nodes, and each node has a capability to play sound in response to an input. Requested output is provided to a most logical connection, for example.

In certain embodiments, a phone device, a television device, and so on can be used to play music, audio, video and/or other multimedia content. In an example, a push button on a microphone or household intercom system to tell the kids dinner is ready is provided over the local playback network.

FIG. 8 shows a flow diagram for a method 800 to provide audio content to a local playback system. In the example method 800 of FIG. 8, a third party application acts as a "virtual line-in" to the local playback system. At block 810, streaming of music or other content from a third party application to a local content playback system is triggered. For example, a "Play to Sonos" button is pressed on a Rhapsody™ application. At block 820, content is streamed to one or more components in a household playback network. The music may be streamed to predetermined zones or players in a household, for example. The music may be

14

further directed to be played in different zones or players throughout the household. Playback on the local network can be facilitated to one or more zones/players based on a configuration (e.g., a zone scene, theme, and so on). Thus, certain embodiments allow a large degree of flexibility in where the music is actually played. For example, the music can be played in the kitchen, the family room, the patio, and so on. Further, the music may be redirected to different zones.

At block 830, the incoming content (e.g., audio) stream is provided directly from a third party application or other external source to the local playback network for playback. For example, rather than passing track identifiers, an audio stream is provided to a Sonos household system for playback to one or more configured zones. At block 840, the local playback system consumes the stream and plays it as it would other content on the local playback (e.g., Sonos™) network (e.g., via zones and so on). At block 850, a playback device (e.g., a zone player, Play:3™, Play:5™, and so on) adds timing information to the streaming content signal (e.g., the device takes the streaming audio signal and repackages it for local synchronized playback). In some embodiments, timing information is not added to the signal unless two or more playback devices are configured to play the audio in synchrony.

FIG. 9 shows a flow diagram for a method 900 to provide audio content to a local playback system. In the example method 900 of FIG. 9, a uniform resource indicator (URI) handler approach is provided for content output. At block 910, a link or other reference is embedded in a third party application (e.g., Facebook™ or Twitter). At block 920, when the link is selected (e.g., clicked), a local playback (e.g., Sonos™) controller, if available, is launched. At block 930, the application (e.g., accessed on a phone, tablet, computer, and so on) passes a URI for associated content (e.g., an audio track and so on) to a local playback system (e.g., Sonos™) controller. At block 940, the local controller outputs the associated content (e.g., plays the music) via the URI. For example, music is streamed from the cloud to one or more playback devices on the local playback network.

In certain embodiments, an application associated with the operating system can register to handle all URIs (URLs) that start with a certain prefix and can define how data is encoded into those URLs so a local playback system application can generate a link (e.g., "sonos:") and put that link into a message (e.g., email, text message, instant message (IM), etc.). The local playback application registered to handle such URLs can parse the URLs to determine what song, playlist, streaming radio station, etc., to play. This launches the controller application. For example, if a first listener likes a song and tweets that song, Twitter™ can include a clickable link which launches a playback application and starts the music playing on a local playback system if the local system can find the song (e.g., if have the application, if have rights/access to the song, etc.). In certain embodiments, the system knows to trigger the receiving user's system rather than the sending user's system to play associated content based on the transmitted link/identifier.

For example, an application can register with the system to handle all URLs that start with a custom prefix (e.g., an HTTP "scheme"). For instance, Sonos controller apps can register to handle any URL that begins with "sonos:" or "x-sonos:". In certain embodiments, a playback system provider can define and publish the format of its URLs so that any third party application can create a link or reference to content. A large amount of data can be encoded into a URL using query parameters, for example.

US 10,779,033 B2

15

In an example, when an application tries to “open” or “browse” to a URL, the system checks to see if the scheme of the URL matches the “sonos:” scheme that has been registered with the application. If a URL handler application is found, the system launches that application (e.g., the application can but does not need to be running in the background) and passes the URL to the application. The application then parses the URL and executes functionality based on the data in the URL. For example, the URL can contain the name of a music service and a playlist identifier from that service, plus the name of a Sonos™ Zone Player, causing the Sonos controller to start that playlist playing on that zone.

FIG. 10 shows a flow diagram for a method 1000 to provide audio content to a local playback system. In the example method 1000 of FIG. 10, at block 1010, a link or other reference is embedded in a third party application (e.g., Facebook™). At block 1020, when the link is selected, a playback system (e.g., Sonos™) server is contacted and provided with information regarding selected content for playback. For example, rather than launching a local controller application, a server is contacted regarding music for playback on a local network. At block 1030, using the provided information, the server identifies and provides the content locally on a user’s local playback system. For example, the server can then start playing the music directly on the user’s Sonos™ system (e.g., without going through a Sonos™ controller application).

In certain embodiments, a “single sign-on” technology is provided so that the user does not need to re-enter a username and password in order to authenticate to the playback server. Example single sign-on technologies include Facebook Connect™, Windows Live ID™, etc.

In certain embodiments, instead of using a specialized link, such as a “sonos:” link, a normal URL can be used to point to a playback system (e.g., Sonos™) webserver, which generates links with special data embedded in the link. A playback system is identified, and content identified by the URL can be playing at via the local playback network (e.g., mesh network configured for home, hotel room, etc.). Parameters such as authentication, security, location, and so on can be configured for local playback of remote content.

FIG. 11 shows a flow diagram for a method 1100 to provide audio content to a local playback system. The example method 1100 of FIG. 11 provides a “throw it over the wall” approach to content delivery to a local playback system. At block 1110, a third party application provides a multimedia playback device (e.g., a Sonos™ zone player (ZP)) with enough information about content (e.g., an audio track) so that, at block 1120, the local playback system (e.g., SonosNet™) can directly access a source of the content and, at block 1130, play the content directly off the network (e.g., the Internet) or cloud.

In certain embodiments, a local playback controller application is not involved. Information passed over to the local playback device may include an identifier for a single track, a playlist, a streaming radio station, a programmed radio station, and so on. This information can also include a current play position within a list to enable near-seamless “handoff” of music from a portable device to a local playback system. Once the music information is handed from the third-party application to the local playback system, there is no further synchronization between the two systems.

A connection between the third-party application and the local playback device (e.g., Sonos ZonePlayer™) can be direct over a local area network (LAN), remote through a proxy server in the cloud, and so on. A LAN delivery

16

approach may be easier to integrate into “native” applications (e.g., applications written for iOS or Android), and a proxy server approach may be easier for third party applications that are browser-based, for example.

In certain embodiments, information is provided from a third party application to a local playback system without being routed through or by a controller application. Here, the third party application is communicating with the multimedia playback device (e.g., a Sonos ZonePlayer™). Information can be passed locally, rather than through the Internet, for example. The local playback device accesses the Internet to find content to stream, and the third party application takes the place of the controller application (e.g., throw it over the wall—the application passes information and the local playback system runs it).

Certain embodiments provide an approach similar to the “throw it over the wall” or one way communication approach of FIG. 11 except that the third party application not only tells the local playback system what to play, but also maintains two-way communication with the local playback (e.g., Sonos™) system. Two-way communication helps enable features such as keeping a local playback queue synchronized with a queue that the user is editing/managing in the third party application; allow the third party application to know what is currently playing on the local playback system; allow integrated transport control between the third party application and the local playback system; and so on.

In certain embodiments, a local playback system can pass information back to a third party application to indicate a current point of playback (e.g., now playing a third song in a playlist, fourth song in the playlist, and so on). The local playback system can pass parameter information, such as a change in volume, from a local multimedia playback device to the third party application so the application can reflect the change in volume to the user via its graphical user interface. The third party application can instruct the local playback system to skip a song, go to a certain location, and so on.

Certain embodiments provide a third party mode that allows users to select from any local playback network (e.g., Sonos™) controller to listen to audio from one or more third party applications on their smartphones or tablets (e.g., Android™ devices). For example, a user may be using a local playback network controller application and now wants a third party application to appear as an audio source within the controller application. The user can then select the controller application that he or she wishes to play audio from the third party application, for example.

Certain embodiments provide queue management to allow a third party application to control a local playback queue. That is, the local playback system has a queue, but the third party application allows users to add, delete and so on from the queue, for example. Rather than switch from content that the user is currently playing, the local playback system allows a user to create a playlist on the fly. For example, if last.fm users vote that they do not like a song and it should be skipped, then the local playback system will skip it.

Certain embodiments allow a third party application to override a local playback queue with its own application-specific queue. The local playback system periodically fetches a short list of tracks to play next. The list of tracks to play is determined by the third-party application, for example. In certain embodiments, a shared queue is provided between the local playback system and the third party application to keep the local system and application synchronized.

US 10,779,033 B2

17

Certain embodiments allow control of playback system functions and/or settings via an external (e.g., third party) application. For example, a local playback system can allow volume control, play/pause, and so on and can interact with an application running on a given platform/operating system (OS). Certain embodiments provide a Web API that can be used to access functionality.

Certain embodiments facilitate control of a local playback system from outside a household or other location at which the local playback network is configured. For example, a user can queue up music while away from his or her house. The application can facilitate setup and/or configuration. For example, a third party application may ask the user to enter a Sonos customer email address and password. The application can then make a request to a Sonos server in the cloud to determine the zone groups on which music can be played.

Various inventions have been described in sufficient detail with a certain degree of particularity. It is understood to those skilled in the art that the present disclosure of embodiments has been made by way of examples only and that numerous changes in the arrangement and combination of parts can be resorted without departing from the spirit and scope of the present disclosure as claimed. While the embodiments discussed herein can appear to include some limitations as to the presentation of the information units, in terms of the format and arrangement, the embodiments have applicability well beyond such embodiment, which can be appreciated by those skilled in the art. Accordingly, the scope of the present disclosure is defined by the appended claims rather than the forgoing description of embodiments.

The invention claimed is:

1. A computing device comprising:

at least one processor;

a non-transitory computer-readable medium; and

program instructions stored on the non-transitory computer-readable medium that, when executed by the at least one processor, cause the computing device to perform functions comprising:

operating in a first mode in which the computing device is configured for playback of a remote playback queue provided by a cloud-based computing system associated with a cloud-based media service;

while operating in the first mode, displaying a representation of one or more playback devices in a media playback system that are each i) communicatively coupled to the computing device over a data network and ii) available to accept playback responsibility for the remote playback queue;

while displaying the representation of the one or more playback devices, receiving user input indicating a selection of at least one given playback device from the one or more playback devices;

based on receiving the user input, transmitting an instruction for the at least one given playback device to take over responsibility for playback of the remote playback queue from the computing device, wherein the instruction configures the at least one given playback device to (i) communicate with the cloud-based computing system in order to obtain data identifying a next one or more media items that are in the remote playback queue, (ii) use the obtained data to retrieve at least one media item in the remote playback queue from the cloud-based media service; and (iii) play back the retrieved at least one media item;

detecting an indication that playback responsibility for the remote playback queue has been successfully

18

transferred from the computing device to the at least one given playback device; and

after detecting the indication, transitioning from i) the first mode in which the computing device is configured for playback of the remote playback queue to ii) a second mode in which the computing device is configured to control the at least one given playback device's playback of the remote playback queue and the computing device is no longer configured for playback of the remote playback queue.

2. The computing device of claim 1, wherein the instruction comprises an instruction for the cloud-based computing system associated with the media service to provide the data identifying the next one or more media items to the given playback device for use in retrieving the at least one media item from the cloud-based computing system associated with the cloud-based media service.

3. The computing device of claim 1, wherein the instruction comprises an instruction for the cloud-based computing system associated with the cloud-based media service to provide the at least one media item to the given playback device.

4. The computing device of claim 1, wherein the representation of the one or more playback devices comprises at least one selectable indicator for a group of playback devices that includes the given playback device and one or more other playback devices that are to be configured for synchronous playback of the remote playback queue, and wherein the user input indicating the selection of at least one given playback device from the one or more playback devices comprises user input indicating a selection of the group of playback devices.

5. The computing device of claim 1, wherein operating in a first mode in which the computing device is configured for playback of the remote playback queue comprises operating in the first mode in which the computing device has received user input indicating a selection of the remote playback queue for playback by the computing device but the computing device has not yet begun playback of the remote playback queue.

6. The computing device of claim 1, further comprising program instructions stored on the non-transitory computer-readable medium that, when executed by the at least one processor, cause the computing device to perform functions comprising:

beginning to operate in the first mode after i) launching a media application associated with the cloud-based media service and ii) receiving user input indicating a selection of the remote playback queue.

7. The computing device of claim 1, wherein:

operating in the first mode further involves providing a control interface comprising one or more selectable control icons that are configured to control playback of the remote playback queue by the computing device;

transitioning from the first mode to the second mode further involves modifying the control interface such that the one or more selectable control icons are configured to control playback of the remote playback queue by the at least one playback device instead of the computing device.

8. The computing device of claim 7, further comprising program instructions stored on the non-transitory computer-readable medium that, when executed by the at least one processor, cause the computing device to perform functions comprising:

after transitioning to the second mode, receiving user input indicating a selection of a given control icon of

US 10,779,033 B2

19

the one or more selectable control icons, wherein the given control icon corresponds to a given transport control operation; and

based on receiving the user input indicating the selection of the given control icon, causing the corresponding transport control operation to be executed by the given playback device.

9. The computing device of claim 8, wherein the transport control operation comprises one of a play operation, a pause operation, a skip forward operation, or a skip back operation.

10. The computing device of claim 1, wherein the cloud-based computing system associated with the cloud-based media service includes one or more cloud servers.

11. The computing device of claim 1, wherein displaying the representation of the one or more playback devices comprises:

displaying the representation of the one or more playback devices in response to receiving a selection of a displayed icon indicating that playback responsibility for the remote playback queue can be transferred.

12. A non-transitory computer-readable medium having stored thereon program instructions that, when executed by at least one processor, cause a computing device to perform functions comprising:

operating in a first mode in which the computing device is configured for playback of a remote playback queue provided by a cloud-based computing system associated with a cloud-based media service;

while operating in the first mode, displaying a representation of one or more playback devices in a media playback system that are each i) communicatively coupled to the computing device over a data network and ii) available to accept playback responsibility for the remote playback queue;

while displaying the representation of the one or more playback devices, receiving user input indicating a selection of at least one given playback device from the one or more playback devices;

based on receiving the user input, transmitting an instruction for the at least one given playback device to take over responsibility for playback of the remote playback queue from the computing device, wherein the instruction configures the at least one given playback device to (i) communicate with the cloud-based computing system in order to obtain data identifying a next one or more media items that are in the remote playback queue, (ii) use the obtained data to retrieve at least one media item in the remote playback queue from the cloud-based media service; and (iii) play back the retrieved at least one media item;

detecting an indication that playback responsibility for the remote playback queue has been successfully transferred from the computing device to the at least one given playback device; and

after detecting the indication, transitioning from i) the first mode in which the computing device is configured for playback of the remote playback queue to ii) a second mode in which the computing device is configured to control the at least one given playback device's playback of the remote playback queue and the computing device is no longer configured for playback of the remote playback queue.

13. The non-transitory computer-readable medium of claim 12, wherein the instruction comprises an instruction

20

for the cloud-based computing system associated with the cloud-based media service to provide the data identifying the next one or more media items to the given playback device for use in obtaining the at least one media item from the cloud-based computing system associated with the cloud-based media service.

14. The non-transitory computer-readable medium of claim 12, wherein the instruction comprises an instruction for the cloud-based computing system associated with the media service to provide the at least one media item to the given playback device.

15. A method carried out by a computing device, the method comprising:

operating in a first mode in which the computing device is configured for playback of a remote playback queue provided by a cloud-based computing system associated with a cloud-based media service;

while operating in the first mode, displaying a representation of one or more playback devices in a media playback system that are each i) communicatively coupled to the computing device over a data network and ii) available to accept playback responsibility for the remote playback queue;

while displaying the representation of the one or more playback devices, receiving user input indicating a selection of at least one given playback device from the one or more playback devices;

based on receiving the user input, transmitting an instruction for the at least one given playback device to take over responsibility for playback of the remote playback queue from the computing device, wherein the instruction configures the at least one given playback device to (i) communicate with the cloud-based computing system in order to obtain data identifying a next one or more media items that are in the remote playback queue, (ii) use the obtained data to retrieve at least one media item in the remote playback queue from the cloud-based media service; and (iii) play back the retrieved at least one media item;

detecting an indication that playback responsibility for the remote playback queue has been successfully transferred from the computing device to the at least one given playback device; and

after detecting the indication, transitioning from i) the first mode in which the computing device is configured for playback of the remote playback queue to ii) a second mode in which the computing device is configured to control the at least one given playback device's playback of the remote playback queue and the computing device is no longer configured for playback of the remote playback queue.

16. The computing device of claim 1, further comprising program instructions stored on the non-transitory computer-readable medium that, when executed by the at least one processor, cause the computing device to perform functions comprising:

before displaying the representation of the one or more playback devices, receiving an indication that the one or more playback devices in the media playback system are available to accept playback responsibility for the remote playback queue.

* * * * *

EXHIBIT 3



US009344206B2

**(12) United States Patent
Lambourne****(10) Patent No.: US 9,344,206 B2****(45) Date of Patent: May 17, 2016****(54) METHOD AND APPARATUS FOR UPDATING
ZONE CONFIGURATIONS IN A MULTI-ZONE
SYSTEM****(71) Applicant: Sonos, Inc.**, Santa Barbara, CA (US)**(72) Inventor: Robert A. Lambourne**, Santa Barbara, CA (US)**(73) Assignee: Sonos, Inc.**, Santa Barbara, CA (US)**(*) Notice:** Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.**(21) Appl. No.: 14/465,457****(22) Filed: Aug. 21, 2014****(65) Prior Publication Data**

US 2014/0361867 A1 Dec. 11, 2014

Related U.S. Application Data**(63)** Continuation of application No. 13/896,829, filed on May 17, 2013, which is a continuation of application No. 11/853,790, filed on Sep. 11, 2007, now Pat. No. 8,483,853.**(60)** Provisional application No. 60/825,407, filed on Sep. 12, 2006.**(51) Int. Cl.**
G06F 17/00 (2006.01)
H04H 60/80 (2008.01)
(Continued)**(52) U.S. Cl.**
CPC **H04H 60/80** (2013.01); **G05B 15/02** (2013.01); **G06F 3/0482** (2013.01); **G06F 3/04842** (2013.01); **G06F 3/16** (2013.01);
(Continued)**(58) Field of Classification Search**
CPC H04H 60/80; H05B 15/02; H04R 3/12;H04R 27/00; H04R 2227/005; H04R 2430/01;
H03G 7/00; H03G 1/02; G06F 3/16; G06F
3/165; G06F 3/0482; G06F 3/04842; H04N
21/43615USPC 700/94; 381/120, 80; 715/716, 727
See application file for complete search history.**(56) References Cited****U.S. PATENT DOCUMENTS**5,182,552 A 1/1993 Paynting
5,406,634 A 4/1995 Anderson et al.
(Continued)**FOREIGN PATENT DOCUMENTS**JP 2009218888 9/2009
JP 2011176581 9/2011

(Continued)

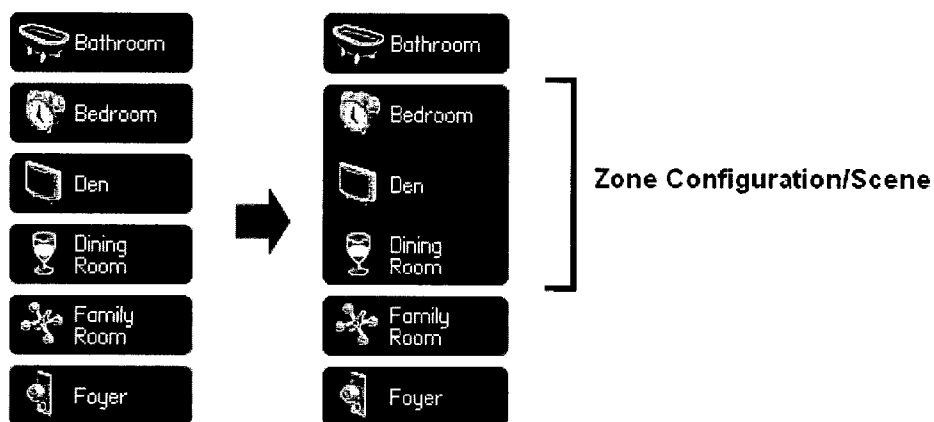
OTHER PUBLICATIONS

Dynaudio Air series speakers; copyright and available for sale at least 2002.*

(Continued)

Primary Examiner — Paul McCord**(74) Attorney, Agent, or Firm** — McDonnell, Boehnen, Hulbert & Berghoff LLP**(57) ABSTRACT**

In general, techniques of controlling a plurality of multimedia players in groups are disclosed. According to one aspect of the present invention, a mechanism is provided to allow a user to group some of the players according to a theme or scene, where each of the players is located in a zone. When the scene is activated, the players in the scene react in a synchronized manner. For example, the players in the scene are all caused to play a multimedia source or music in a playlist, wherein the multimedia source may be located anywhere on a network.

20 Claims, 11 Drawing Sheets

US 9,344,206 B2

Page 2

- (51) **Int. Cl.**
- | | | | | |
|---|-----------|-------------------|---------|---------------------------|
| G05B 15/02 | (2006.01) | 8,588,432 B1 | 11/2013 | Simon |
| H04R 3/12 | (2006.01) | 8,700,730 B2 | 4/2014 | Rowe |
| G06F 3/16 | (2006.01) | 8,762,565 B2 | 6/2014 | Togashi et al. |
| H03G 7/00 | (2006.01) | 8,788,080 B1 | 7/2014 | Kallai et al. |
| H04N 21/436 | (2011.01) | 8,965,544 B2 | 2/2015 | Ramsay |
| G06F 3/0482 | (2013.01) | 2001/0042107 A1 | 11/2001 | Palm |
| G06F 3/0484 | (2013.01) | 2002/0002039 A1 | 1/2002 | Qureshey et al. |
| H03G 1/02 | (2006.01) | 2002/0003548 A1 | 1/2002 | Krusche et al. |
| H04R 27/00 | (2006.01) | 2002/0022453 A1 | 2/2002 | Balog |
| | | 2002/0026442 A1 | 2/2002 | Lipscomb |
| | | 2002/0072816 A1 | 6/2002 | Shdema et al. |
| | | 2002/0098878 A1 | 7/2002 | Mooney et al. |
| | | 2002/0124097 A1 | 9/2002 | Isely et al. |
| | | 2002/0143547 A1 * | 10/2002 | Fay et al. 704/270 |
| (52) U.S. Cl. | | 2003/0020763 A1 | 1/2003 | Mayer et al. |
| CPC G06F 3/165 (2013.01); H03G 1/02 | | 2003/0157951 A1 | 8/2003 | Hasty, Jr. |
| (2013.01); H03G 7/00 (2013.01); H04N | | 2003/0167335 A1 | 9/2003 | Alexander |
| 21/43615 (2013.01); H04R 3/12 (2013.01); | | 2003/0177889 A1 | 9/2003 | Koseki et al. |
| H04R 27/00 (2013.01); H04R 2227/005 | | 2003/0198257 A1 | 10/2003 | Sullivan et al. |
| (2013.01); H04R 2430/01 (2013.01) | | 2004/0010727 A1 | 1/2004 | Fujinami |
| | | 2004/0015252 A1 | 1/2004 | Aiso et al. |
| | | 2004/0024478 A1 | 2/2004 | Hans |
| | | 2004/0117044 A1 | 6/2004 | Konetski |
| | | 2004/0131192 A1 | 7/2004 | Metcalf |
| | | 2004/0147224 A1 * | 7/2004 | Lee 455/41.3 |
| | | 2004/0220687 A1 * | 11/2004 | Klotz et al. 700/94 |
| | | 2004/0223622 A1 | 11/2004 | Lindemann et al. |
| | | 2004/0225389 A1 | 11/2004 | Ledoux et al. |
| | | 2005/0002535 A1 | 1/2005 | Liu et al. |
| | | 2005/0021470 A1 | 1/2005 | Martin et al. |
| | | 2005/0100174 A1 | 5/2005 | Howard et al. |
| | | 2005/0131558 A1 | 6/2005 | Braithwaite et al. |
| | | 2005/0144284 A1 | 6/2005 | Ludwig et al. |
| | | 2005/0177256 A1 | 8/2005 | Shintani et al. |
| | | 2005/0254505 A1 | 11/2005 | Chang et al. |
| | | 2005/0289244 A1 | 12/2005 | Sahu et al. |
| | | 2006/0041616 A1 | 2/2006 | Ludwig et al. |
| | | 2006/0149402 A1 | 7/2006 | Chung |
| | | 2006/0179160 A1 | 8/2006 | Uehara et al. |
| | | 2006/0205349 A1 | 9/2006 | Passier et al. |
| | | 2006/0229752 A1 | 10/2006 | Chung |
| | | 2007/0142022 A1 | 6/2007 | Madonna et al. |
| | | 2007/0142944 A1 | 6/2007 | Goldberg et al. |
| | | 2007/0189544 A1 | 8/2007 | Rosenberg |
| | | 2007/0223725 A1 | 9/2007 | Neumann et al. |
| | | 2007/0288610 A1 | 12/2007 | Saint Clair et al. |
| | | 2008/0025535 A1 | 1/2008 | Rajapakse |
| | | 2008/0045140 A1 | 2/2008 | Korhonen |
| | | 2008/0066094 A1 | 3/2008 | Igoe |
| | | 2008/0066120 A1 | 3/2008 | Igoe |
| | | 2008/0077261 A1 | 3/2008 | Baudino et al. |
| | | 2008/0092204 A1 * | 4/2008 | Bryce et al. 725/143 |
| | | 2008/0144861 A1 | 6/2008 | Melanson et al. |
| | | 2008/0152165 A1 | 6/2008 | Zacchi |
| | | 2008/0159545 A1 | 7/2008 | Takumai et al. |
| | | 2008/0162668 A1 | 7/2008 | Miller |
| | | 2009/0097672 A1 | 4/2009 | Buil et al. |
| | | 2009/0228919 A1 | 9/2009 | Zott et al. |
| | | 2009/0232326 A1 | 9/2009 | Gordon et al. |
| | | 2010/0010651 A1 | 1/2010 | Kirkeby et al. |
| | | 2010/0052843 A1 | 3/2010 | Cannistraro |
| | | 2010/0153097 A1 | 6/2010 | Hotho et al. |
| | | 2010/0284389 A1 | 11/2010 | Ramsay et al. |
| | | 2010/0299639 A1 | 11/2010 | Ramsay et al. |
| | | 2012/0047435 A1 | 2/2012 | Holladay et al. |
| | | 2013/0253679 A1 | 9/2013 | Lambourne |
| | | 2013/0293345 A1 | 11/2013 | Lambourne |
- (56) **References Cited**
- U.S. PATENT DOCUMENTS
- | | | |
|----------------|---------|-----------------------------|
| 5,519,641 A | 5/1996 | Beers et al. |
| 5,923,902 A | 7/1999 | Inagaki |
| 5,946,343 A | 8/1999 | Schotz et al. |
| 6,256,554 B1 | 7/2001 | DiLorenzo |
| 6,404,811 B1 | 6/2002 | Cvetko et al. |
| 6,487,296 B1 | 11/2002 | Allen et al. |
| 6,522,886 B1 | 2/2003 | Youngs et al. |
| 6,587,127 B1 | 7/2003 | Leeke et al. |
| 6,604,023 B1 | 8/2003 | Brown et al. |
| 6,611,537 B1 | 8/2003 | Edens et al. |
| 6,631,410 B1 | 10/2003 | Kowalski et al. |
| 6,757,517 B2 | 6/2004 | Chang |
| 6,778,869 B2 | 8/2004 | Champion |
| 6,889,207 B2 | 5/2005 | Slemmer et al. |
| 7,130,608 B2 | 10/2006 | Hollstrom et al. |
| 7,130,616 B2 | 10/2006 | Janik |
| 7,143,939 B2 | 12/2006 | Henzerling |
| 7,187,947 B1 | 3/2007 | White et al. |
| 7,218,708 B2 | 5/2007 | Berezowski et al. |
| 7,236,773 B2 | 6/2007 | Thomas |
| 7,302,468 B2 | 11/2007 | Wijeratne |
| 7,346,332 B2 * | 3/2008 | McCarty et al. 455/402 |
| 7,483,538 B2 | 1/2009 | McCarty et al. |
| 7,539,551 B2 | 5/2009 | Komura et al. |
| 7,558,224 B1 | 7/2009 | Surazski et al. |
| 7,561,932 B1 * | 7/2009 | Holmes et al. 700/94 |
| 7,571,014 B1 | 8/2009 | Lambourne et al. |
| 7,626,952 B2 | 12/2009 | Slemmer et al. |
| 7,643,894 B2 | 1/2010 | Braithwaite et al. |
| 7,657,910 B1 | 2/2010 | McAulay et al. |
| 7,668,990 B2 | 2/2010 | Krzyzanowski et al. |
| 7,689,305 B2 | 3/2010 | Kreifeldt et al. |
| 7,742,832 B1 | 6/2010 | Feldman et al. |
| 7,761,176 B2 | 7/2010 | Ben-Yaacov et al. |
| 7,804,972 B2 | 9/2010 | Melanson |
| 7,805,210 B2 | 9/2010 | Cucos et al. |
| 7,817,960 B2 | 10/2010 | Tan et al. |
| 7,849,181 B2 | 12/2010 | Slemmer et al. |
| 7,853,341 B2 | 12/2010 | McCarty et al. |
| 7,962,482 B2 | 6/2011 | Handman et al. |
| 8,014,423 B2 | 9/2011 | Thaler et al. |
| 8,045,952 B2 | 10/2011 | Qureshey et al. |
| 8,054,987 B2 | 11/2011 | Seydoux |
| 8,086,287 B2 | 12/2011 | Mooney et al. |
| 8,103,009 B2 | 1/2012 | McCarty et al. |
| 8,135,141 B2 | 3/2012 | Shiba |
| 8,189,824 B2 | 5/2012 | Strauss et al. |
| 8,233,635 B2 | 7/2012 | Shiba |
| 8,234,395 B2 | 7/2012 | Millington |
| 8,239,559 B2 | 8/2012 | Rajapakse |
| 8,290,603 B1 | 10/2012 | Lambourne |
| 8,423,893 B2 | 4/2013 | Ramsay et al. |
| 8,483,853 B1 | 7/2013 | Lambourne |
| 8,498,726 B2 | 7/2013 | Kim et al. |
- FOREIGN PATENT DOCUMENTS
- | | | |
|----|------------|---------|
| WO | 0153994 | 7/2001 |
| WO | 2005013047 | 2/2005 |
| WO | 2012137190 | 10/2012 |
- OTHER PUBLICATIONS
- Bluetooth, "Specification of the Bluetooth System: The ad hoc SCATTERNET for affordable and highly functional wireless connectivity" Core, Version 1.0 A, Jul. 26, 1999, 1068 pages.(Document

US 9,344,206 B2

Page 3

(56)

References Cited

OTHER PUBLICATIONS

uploaded in 7 different files: NPL1_part1 pp. 1 to 150, NPL1_part2 pp. 151 to 300, NPL1_part3 pp. 301 to 450, NPL1_part4 pp. 451 to 600, NPL1_part5 pp. 601 to 750, NPL1_part6 pp. 751 to 900 and NPL1_part7 pp. 901 to 1068).

Bluetooth. "Specification of the Bluetooth System: Wireless connections made easy" Core, Version 1.0 B, Dec. 1, 1999, 1081 pages. (Document uploaded in 8 different files: NPL2_part1 pp. 1 to 150, NPL2_part2 pp. 151 to 303, NPL2_part3 pp. 304 to 453, NPL2_part4 pp. 454 to 603, NPL2_part5 pp. 604 to 703, NPL2_part6 pp. 704 to 854 and NPL2_part7 pp. 855 to 1005, NPL2_part8 pp. 1006 to 1081).

Dell, Inc., "Dell Digital Audio Receiver: Reference Guide", Jun. 2000, 70 pages.

Dell, Inc., "Start Here", Jun. 2000, 2 pages.

Jones, Stephen, "Dell Digital Audio Receiver: Digital upgrade for your analog stereo" Analog Stereo, Jun. 24, 2000 <<http://www.reviewsonline.com/articles/961906864.htm>> retrieved Jun. 18, 2014, 2 pages.

Louderback, Jim, "Affordable Audio Receiver Furnishes Homes With MP3", TechTV Vault, Jun. 28, 2000 <<http://www.g4tv.com/articles/17923/affordable-audio-receiver-furnishes-homes-with-mp3/>> retrieved Jul. 10, 2014, 2 pages.

United States Patent and Trademark Office, "Non-Final Office Action", issued in connection with U.S. Appl. No. 13/896,037, mailed on Feb. 13, 2014, 10 pages.

United States Patent and Trademark Office, "Non-Final Office Action", issued in connection with U.S. Appl. No. 13/892,230, mailed on May 9, 2014, 10 pages.

United States Patent and Trademark Office, "Notice of Allowance", issued in connection with U.S. Appl. No. 13/896,037, mailed on Oct. 28, 2014, 7 pages.

Palm, Inc., "Handbook for the Palm VII Handheld", May 2000, 311 pages.

Higgins et al., "Presentations at WinHEC 2000" May 2000, 138 pages.

The United States Patent and Trademark Office, "Non-Final Office Action", issued in connection with U.S. Appl. No. 13/013,740, mailed on Feb. 10, 2014, 13 pages.

Rane: DragNet software; available for sale at least 2006, 8 pages.

Yamaha DME Designer software manual: Copyright 2004, 482 pages.

Co-pending U.S. Appl. No. 13/083,499, filed Apr. 8, 2011, 69 pages.

The United States Patent and Trademark Office, "Final Office Action", issued in connection with U.S. Appl. No. 13/013,740, mailed on Feb. 10, 2014, 13 pages.

International Bureau, "International preliminary report on patentability," issued in connection with International Patent Application No. PCT/182012/052071, mailed Oct. 17, 2013, 7 pages.

The United States Patent and Trademark Office, "Non-Final Office Action", issued in connection with U.S. Appl. No. 13/013,740, mailed on Sep. 27, 2013, 12 pages.

International Bureau, "Search Report", issued in connection with PCT Application No. PCT/IB2012/052071, mailed on Aug. 23, 2012, 3 pages.

Jo J., et al., "Synchronized One-to-many Media Streaming with Adaptive Payout Control," Proceedings of SPIE, 2002, vol. 4861, pp. 71-82.

Mills D.L., "Network Time Protocol (Version 3) Specification, Implementation and Analysis," Network Working Group, Mar. 1992, <<http://www.ietf.org/rfc/rfc1305.txt>>, 7 pages.

"Polycom Conference Composer manual: copyright 2001", 29 pages.

International Bureau, "Written Opinion", issued in connection with PCT Application No. PCT/IB2012/052071, mailed on Aug. 23, 2012, 6 pages.

The United States Patent and Trademark Office, "Advisory Action", issued in connection with U.S. Appl. No. 11/853,790, mailed Dec. 22, 2011, 3 pages.

The United States Patent and Trademark Office, "Final Office Action", issued in connection with U.S. Appl. No. 11/853,790, mailed Oct. 13, 2011, 9 pages.

The United States Patent and Trademark Office, "Notice of Allowance", issued in connection with U.S. Appl. No. 11/853,790, mailed Apr. 18, 2013, 8 pages.

The United States Patent and Trademark Office, "Non-Final Office Action", issued in connection with U.S. Appl. No. 11/853,790, mailed Mar. 8, 2011, 12 pages.

"UPnP; "Universal Plug and Play Device Architecture"; Jun. 8, 2000; version 1.0; Microsoft Corporation; pp. 1-54".

Voyetra; Turtle Beach Inc., "Audio Tron Quick Start Guide, Version 1.0", Mar. 2001, 24 pages.

Voyetra; Turtle Beach Inc., "Audio Tron Reference Manual, Version 3.0", May 2002, 70 pages.

Voyetra; Turtle Beach Inc., "Audio Tron Setup Guide, Version 3.0", May 2002, 38 pages.

"Yamaha DME 32 manual": copyright 2000, pp. 296.

The United States Patent and Trademark Office, "Notice of Allowance," issued in connection with U.S. Appl. No. 13/896,829, mailed on Jun. 12, 2014, 54 pages.

The United States Patent and Trademark Office, "Non-Final Office Action," issued in connection with U.S. Appl. No. 13/896,829, mailed on Jan. 7, 2014, 9 pages.

The United States Patent and Trademark Office, "Non-Final Office Action," issued in connection with U.S. Appl. No. 14/256,434, mailed on Jul. 23, 2014, 12 pages.

The United States Patent and Trademark Office, "Notice of Allowance," issued in connection with U.S. Appl. No. 13/083,499, mailed on Jun. 2, 2014, 5 pages.

"Yamaha DME 64 Owner's Manual; copyright 2004, 80 pages".

"Yamaha DME Designer 3.5 set-up manual guide; copyright 2004, 16 pages".

Yamaha, "DME Designer 3.5 User Manual", Copyright 2004, 507 pages. (Document uploaded in 5 different files:— NPL28_part1 pp. 1 to 128,— NPL28_part2 pp. 129 to 263,— NPL28_part3 pp. 264 to 378,— NPL28_part4 pp. 379 to 471,— NPL28_part5 pp. 472 to 507).

The United States Patent and Trademark Office, "Final Office Action," issued in connection with U.S. Appl. No. 13/896,037, mailed on Jul. 23, 2014, 12 pages.

The United States Patent and Trademark Office, "Notice of Allowance", issued in connection with U.S. Appl. No. 13/892,230, mailed on Sep. 10, 2014, 5 pages.

Canadian Patent Office "Office Action", issued in connection with Canadian Patent Application No. 2,832,542, mailed on Apr. 10, 2015, 3 pages.

Dorwaldt Carl, "EASE 4.1 Tutorial", Renkus-Heinz, Inc., 2004, 417 pages.(NPL uploaded in 3 parts).

United States Patent and Trademark Office, "Non-Final Office Action" issued in connection with U.S. Appl. No. 14/299,847, mailed on Mar. 23, 2015, 14 pages.

Notice of Allowance mailed on Jul. 10, 2015, issued in connection with U.S. Appl. No. 13/013740, filed Jan. 25, 2011, 9 pages.

"Corrected Notice of Allowance mailed on Oct. 30, 2015, issued in connection with U.S. Appl. No. 13/013,740, filed Jan. 25, 2011, 2 pages."

"Notice of Allowance mailed on May 13, 2015, issued in connection with U.S. Appl. No. 14/299,847, filed Jun. 9, 2014, 10 pages."

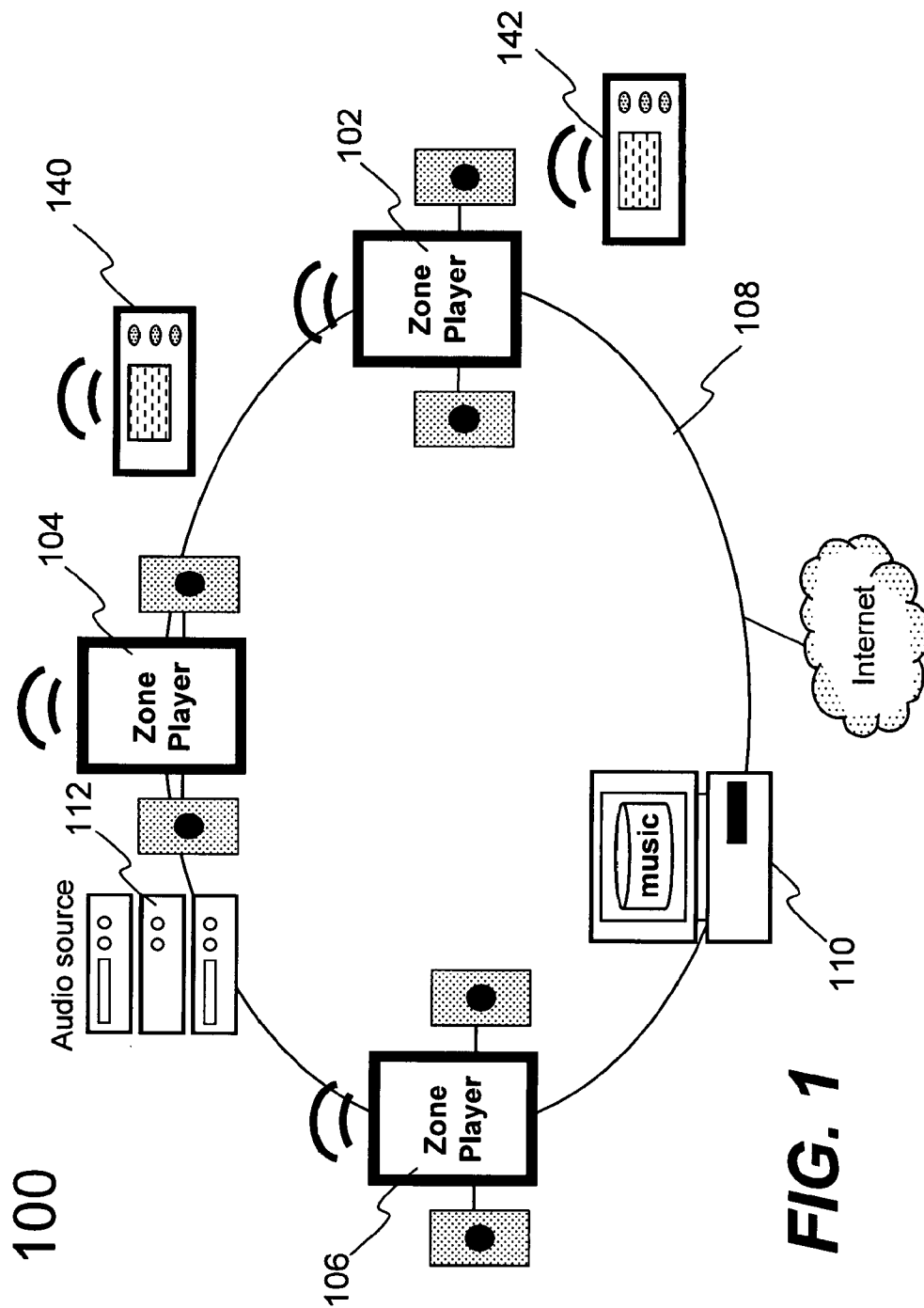
Notice of Allowance mailed on Oct. 27, 2015, issued in connection with U.S. Appl. No. 14/299,847, filed Jun. 9, 2014, 5 pages.

United States Patent and Trademark Office, "Non-Final Office Action", issued in connection with U.S. Appl. No. 13/013,740, mailed on Feb. 13, 2015, 14 pages.

United States Patent and Trademark Office, "Notice of Allowance", issued in connection with U.S. Appl. No. 14/256,434, mailed on Dec. 5, 2014, 7 pages.

Intellectual Property Office of Japan, "Office action", issued in connection with Japanese patent application No. 2014-503273, issue on Jan. 6, 2015, 5 pages.

* cited by examiner



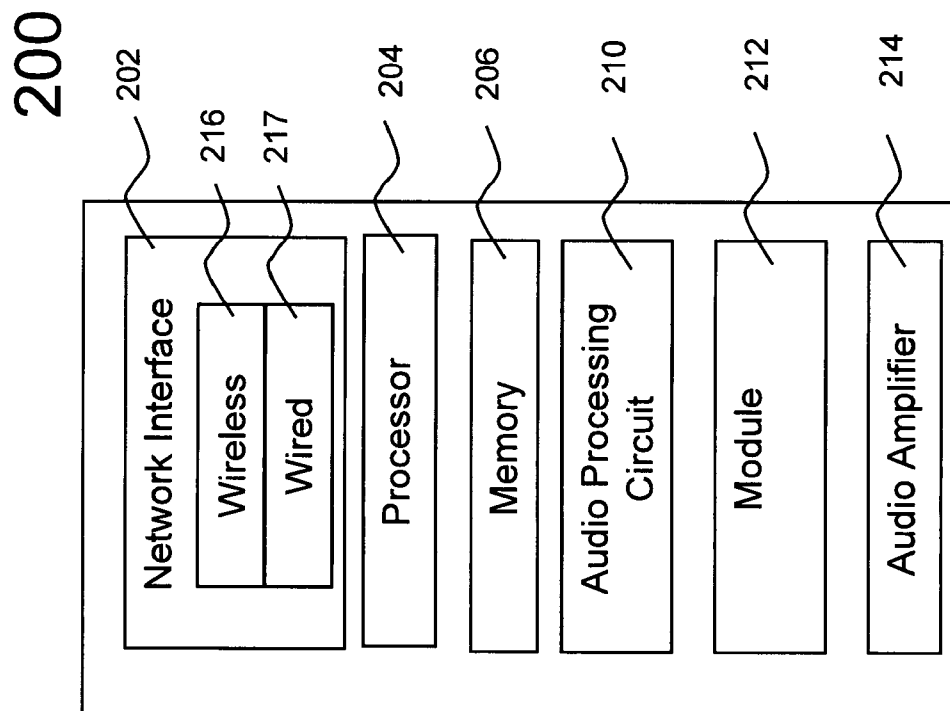


FIG. 2A

240

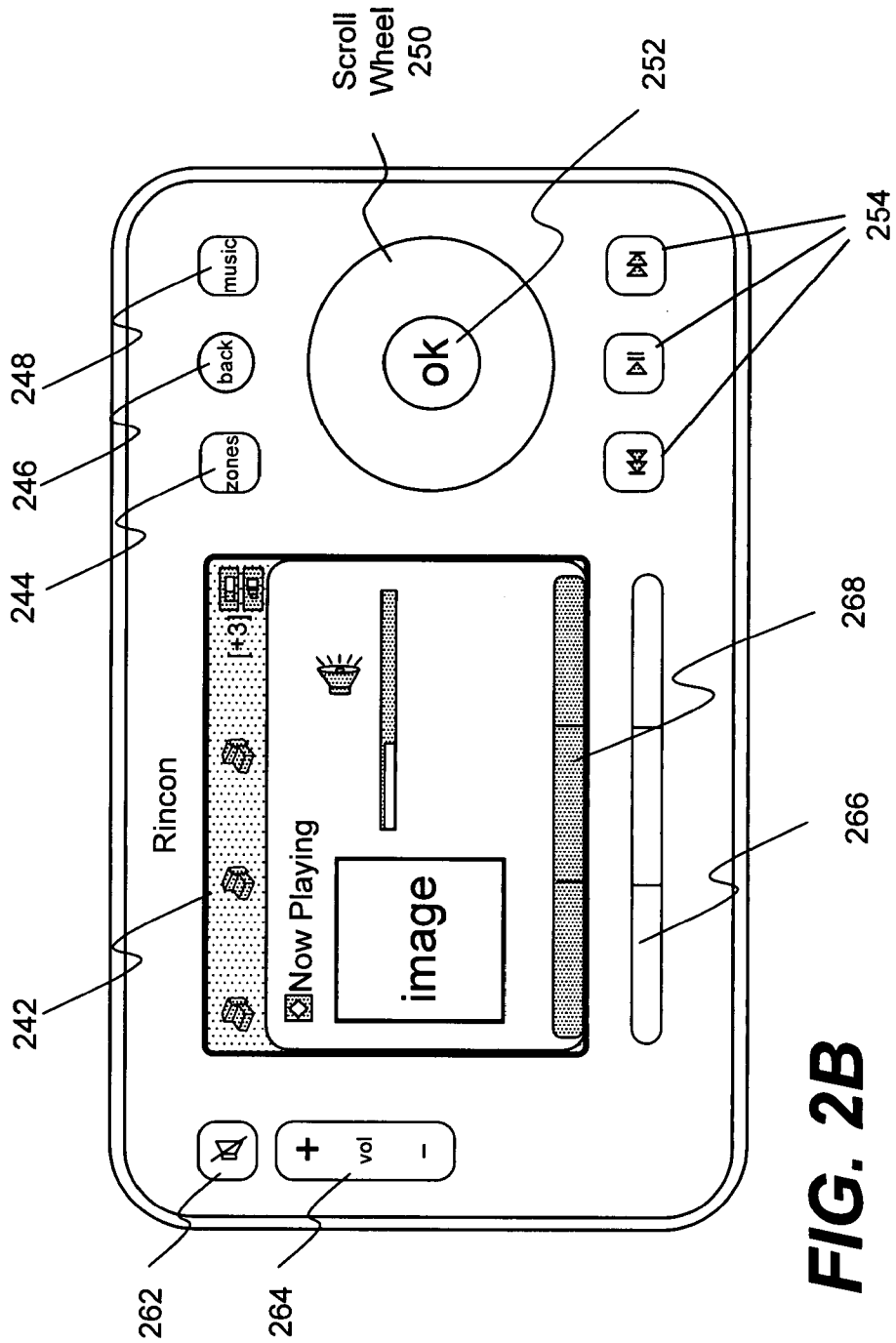


FIG. 2B

270

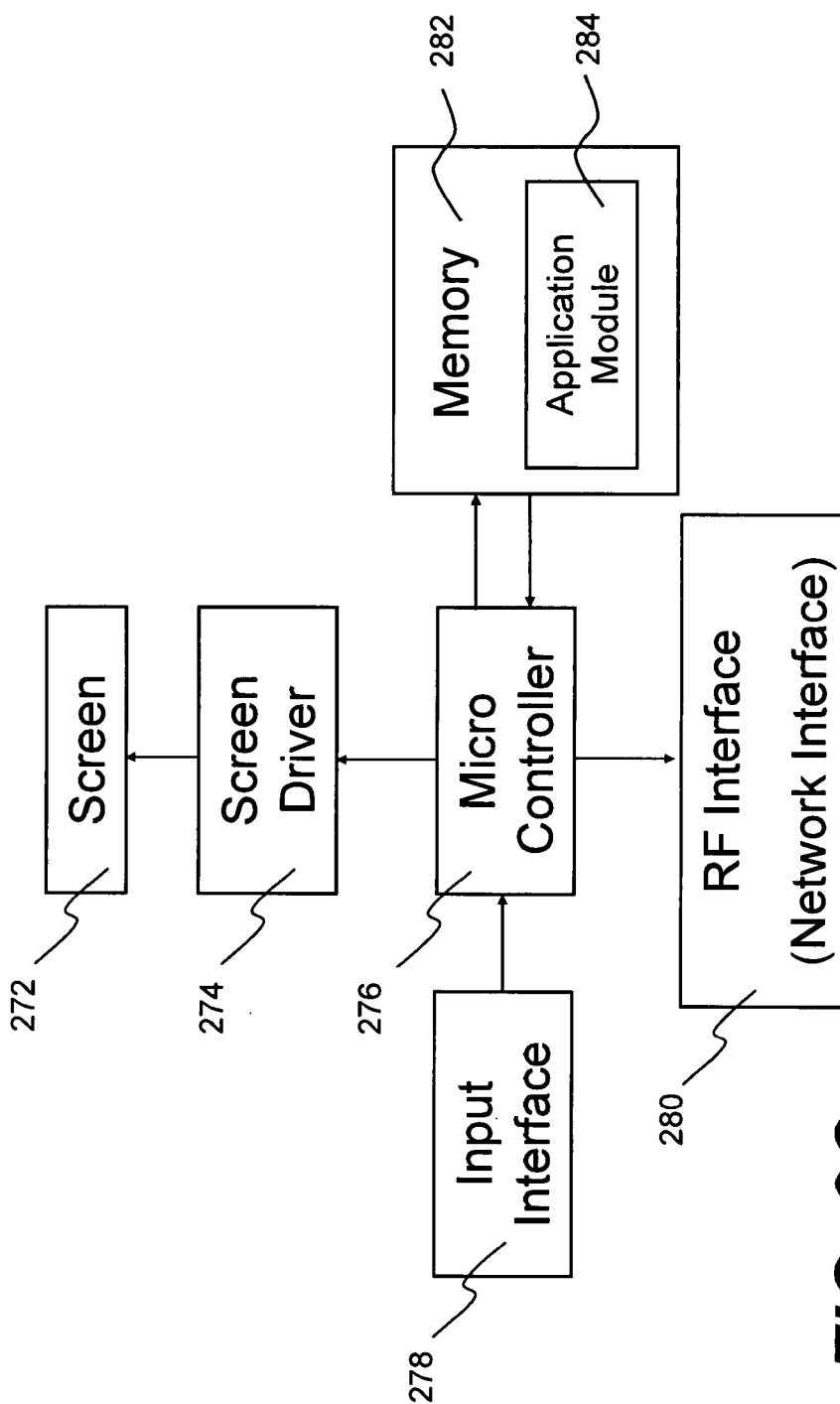


FIG. 2C

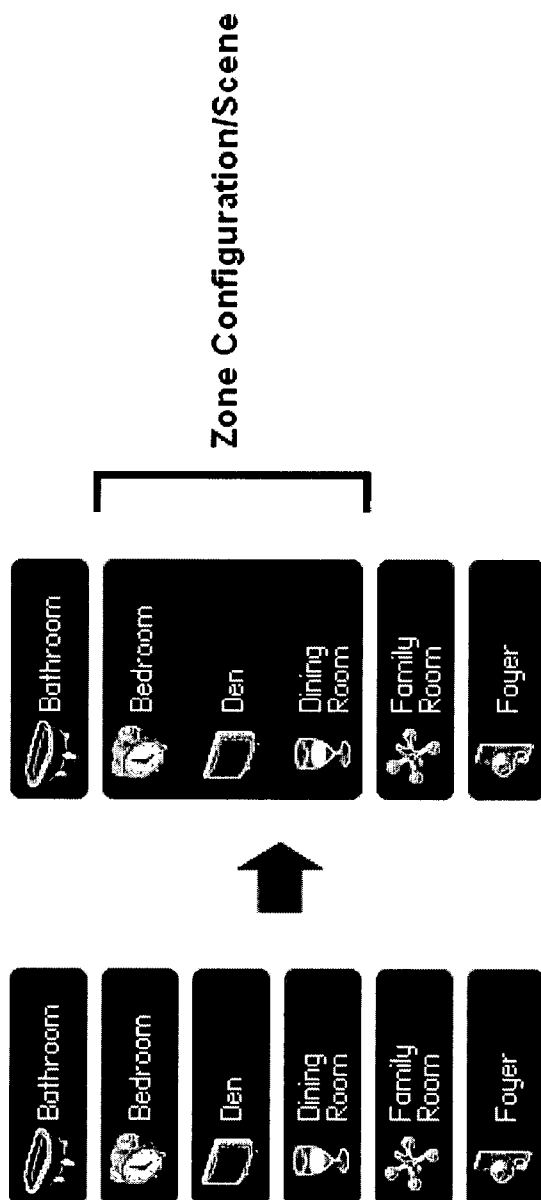


FIG. 3A

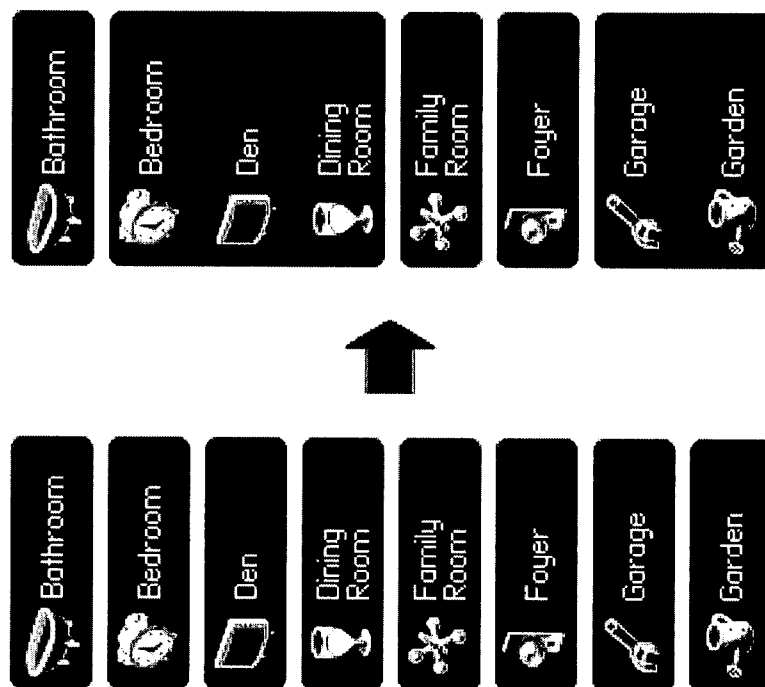
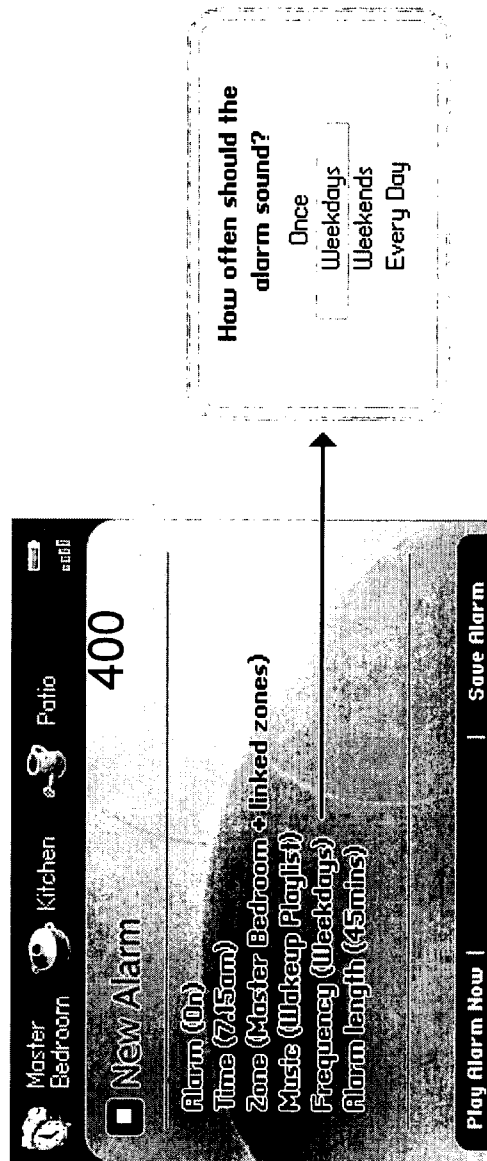
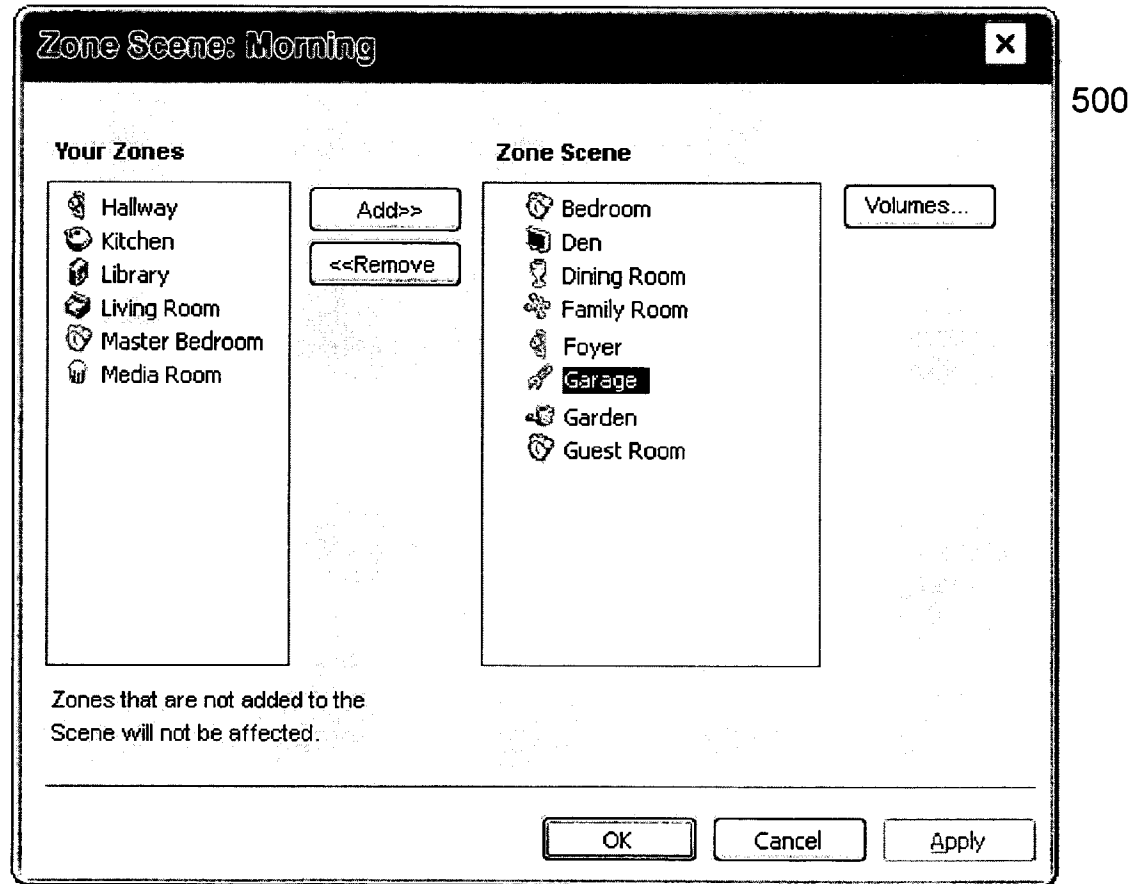


FIG. 3B



**FIG. 5A**

520

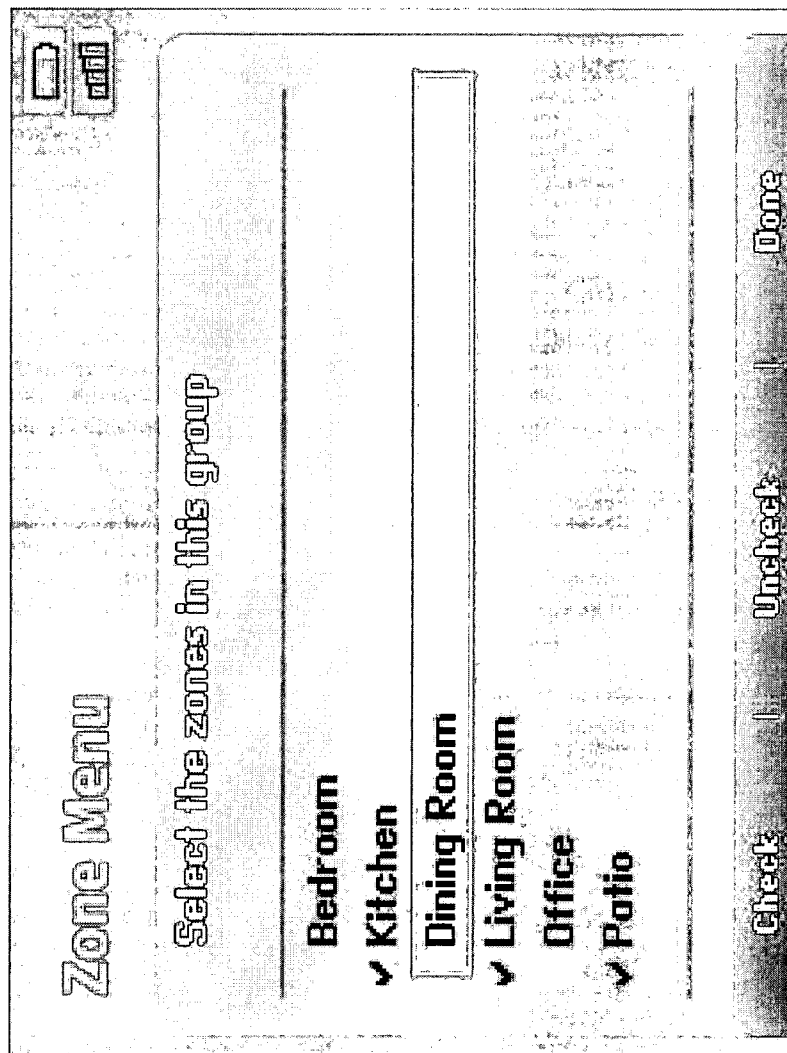
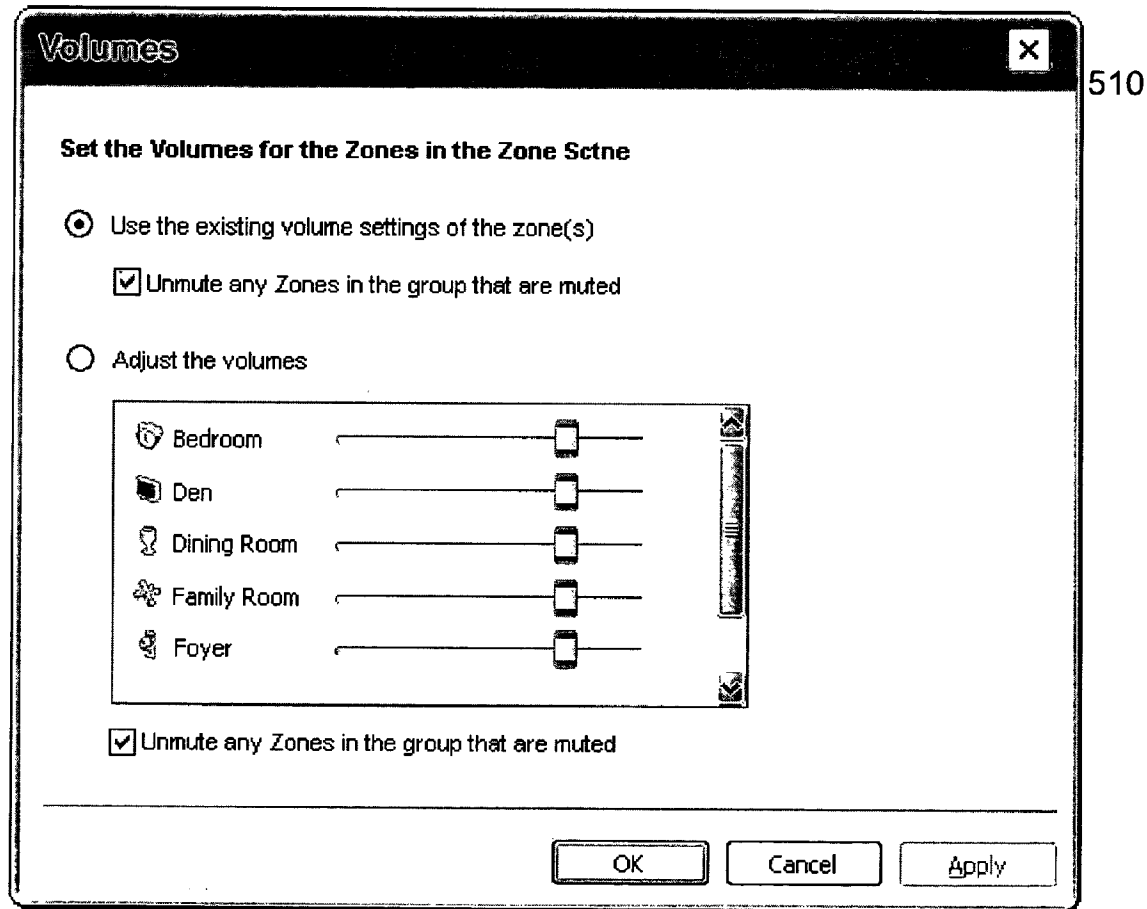


FIG. 5B

**FIG. 5C**

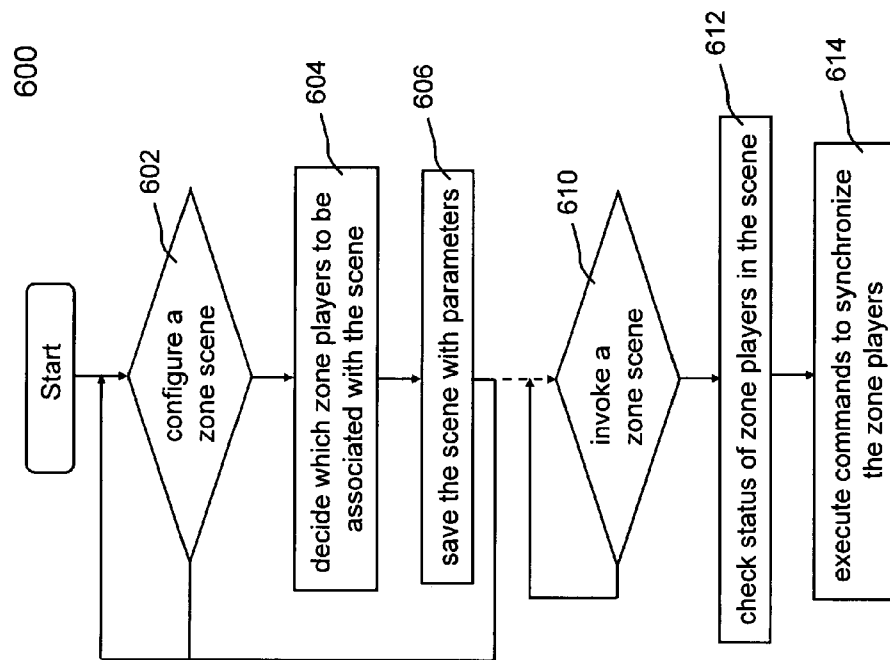


FIG. 6

US 9,344,206 B2

1

**METHOD AND APPARATUS FOR UPDATING
ZONE CONFIGURATIONS IN A MULTI-ZONE
SYSTEM****CROSS REFERENCE TO RELATED
APPLICATION**

This application is a continuation of and claims priority to U.S. patent application Ser. No. 13/896,829, filed on May 17, 2013, entitled "METHOD AND APPARATUS FOR UPDATING ZONE CONFIGURATIONS IN A MULTI-ZONE SYSTEM" and to U.S. patent application Ser. No. 11/853,790, filed Sep. 11, 2007, entitled "CONTROLLING AND MANIPULATING GROUPINGS IN A MULTI-ZONE MEDIA SYSTEM," and U.S. Provisional Application No. 60/825,407 filed on Sep. 12, 2006, entitled "CONTROLLING AND MANIPULATING GROUPINGS IN A MULTI-ZONE MEDIA SYSTEM," each of which is hereby incorporated by reference in its entirety for all purposes.

BACKGROUND OF THE INVENTION**Field of the Invention**

The invention is generally related to the area of consumer electronics and human-computer interaction. In particular, the invention is related to method and apparatus for controlling or manipulating a plurality of multimedia players in a multi-zone system.

An enduring passion for quality audio reproduction or system is continuing to drive demands from users. One of the demands includes an audio system in a house in which, for example, one could grill to classic rock on a patio while another one may cook up his/her own music selections in a kitchen. This is all at the same time while a teenager catches a ballgame in a family room, and another one blasts pop in a bedroom. And the best part of such audio system is that each family member does not need his or her own stereo system—one system gives everyone access to all the music sources.

Currently, one of the systems that can meet part of such demand is a conventional multi-zone audio system that usually includes a number of audio players. Each of the audio players has its own amplifier(s) and a set of speakers and typically installed in one place (e.g., a room). In order to play an audio source at one location, the audio source must be provided locally or from a centralized location. When the audio source is provided locally, the multi-zone audio system functions as a collection of many stereo systems, making source sharing difficult. When the audio source is provided centrally, the centralized location may include a juke box, many compact discs, an AM or FM radio, tapes, or others. To send an audio source to an audio player demanding such source, a cross-bar type of device is used to prevent the audio source from going to other audio players that may be playing other audio sources.

In order to achieve playing different audio sources in different audio players, the traditional multi-zone audio system is generally either hard-wired or controlled by a pre-configured and pre-programmed controller. While the pre-programmed configuration may be satisfactory in one situation, it may not be suitable for another situation. For example, a person would like to listen to broadcast news from his/her favorite radio station in a bedroom, a bathroom and a den while preparing to go to work in the morning. The same person may wish to listen in the den and the living room to music from a compact disc in the evening. In order to satisfy such requirements, two groups of audio players must be

2

established. In the morning, the audio players in the bedroom, the bathroom and the den need to be grouped for the broadcast news. In the evening, the audio players in the den and the living room are grouped for the music. Over the weekend, the audio players in the den, the living room, and a kitchen are grouped for party music. Because the morning group, the evening group and the weekend group contain the den, it can be difficult for the traditional system to accommodate the requirement of dynamically managing the ad hoc creation and deletion of groups.

There is a need for dynamic control of the audio players as a group. With a minimum manipulation, the audio players may be readily grouped. In a traditional multi-zone audio system, the audio players have to be adjusted one at a time, resulting in an inconvenient and non-homogenous audio environment. Further, there is a need to individually or systematically adjust the audio volume of the audio players.

SUMMARY OF THE INVENTION

This section is for the purpose of summarizing some aspects of the present invention and to briefly introduce some preferred embodiments. Simplifications or omissions in this section as well as in the abstract or the title of this description may be made to avoid obscuring the purpose of this section, the abstract and the title. Such simplifications or omissions are not intended to limit the scope of the present invention.

In general, the present invention pertains to controlling a plurality of multimedia players, or simply players, in groups. According to one aspect of the present invention, a mechanism is provided to allow a user to group some of the players according to a theme or scene, where each of the players is located in a zone. When the scene is activated, the players in the scene react in a synchronized manner. For example, the players in the scene are all caused to play an audio source or music in a playlist, wherein the audio source may be located anywhere on a network.

According to another aspect of the present invention, the scene may be activated at any time or a specific time. A user may activate the scene at any time so that only some selected zones in an entertainment system facilitate a playback of an audio source. When the scene is activated at a specific time, the scene may be used as an alarm or buzzer.

According to still another aspect of the present invention, a controlling device (also referred to herein as controller) is provided to facilitate a user to select any of the players in the system to form respective groups each of which is set up per a scene. Although various scenes may be saved in any of the members in a group, commands are preferably sent from the controller to the rest of the members when one of the scenes is executed. Depending on implementation, the commands include parameters pertaining to identifiers of the players, volumes settings, audio source and etc.

According to yet another aspect of the present invention, a configurable module is implemented in the controlling device that provides interactive graphic user interface for forming, managing and controlling groups in the system, de-grouping a group or adjusting audio volume of individual players or a group of players.

The present invention may be implemented in many forms including software, hardware or a combination of both. According to one embodiment, the present invention is directed to a method for groupings in a multi-zone media system, the method comprises providing a mechanism to allow a user to determine which players in the system to be associated with a theme representing a group; and configuring the theme with parameters pertaining to the players,

US 9,344,206 B2

3

wherein the theme is activated at anytime or a specific time so that the players react in a synchronized manner. The players in a scene are synchronized to play a multimedia file when the scene is activated.

According to another embodiment, the present invention is directed to an entertainment system for grouping players, the system comprises: a plurality of players, each located in one zone; and a controller providing a mechanism to allow a user to select which of the players to be associated with a theme representing a group; and configure the theme with parameters pertaining to the selected players, wherein the theme is activated at anytime or a specific time so that the selected players react in a synchronized manner. As a result, the selected players are synchronized to play a multimedia that is in a digital format and retrieved from a source over a network.

One of the objects, features, and advantages of the present invention is to remotely control a plurality of multimedia players in a multi-zone system, playing and controlling the audio source synchronously if the players are grouped together, or playing and controlling the audio source individually if the players are disassociated with each other.

Other objects, features, and advantages of the present invention will become apparent upon examining the following detailed description of an embodiment thereof, taken in conjunction with the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other features, aspects, and advantages of the present invention will become better understood with regard to the following description, appended claims, and accompanying drawings where:

FIG. 1 shows an exemplary configuration in which the present invention may be practiced;

FIG. 2A shows an exemplary functional block diagram of a player in accordance with the present invention;

FIG. 2B shows an example of a controller that may be used to remotely control one of more players of FIG. 2A;

FIG. 2C shows an exemplary internal functional block diagram of a controller in accordance with one embodiment of the present invention;

FIG. 3A provides an illustration of one zone scene, where the left column shows the starting zone grouping—all zones are separate, the column on the right shows the effects of grouping the zones to make a group of 3 zones named after “Morning”;

FIG. 3B shows that a user defines multiple groups to be gathered at the same time;

FIG. 4 shows an exemplary user interface that may be displayed on a controller or a computer of FIG. 1;

FIG. 5A shows a user interface to allow a user to form a scene;

FIG. 5B shows another user interface 520 to allow a user to form a scene;

FIG. 5C shows a user interface to allow a user to adjust a volume level of the zone players in a zone scene individually or collectively; and

FIG. 6 shows a flowchart or process of providing a player theme or a zone scene for a plurality of players, where one or more of the players are placed in a zone.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The detailed description of the invention is presented largely in terms of procedures in terms of procedures, steps, logic blocks, processing, and other symbolic representations

4

that directly or indirectly resemble the operations of data processing devices coupled to networks. These process descriptions and representations are typically used by those skilled in the art to most effectively convey the substance of their work to others skilled in the art. Numerous specific details are set forth in order to provide a thorough understanding of the present invention. However, it will become obvious to those skilled in the art that the present invention may be practiced without these specific details. In other instances, well known methods, procedures, components, and circuitry have not been described in detail to avoid unnecessarily obscuring aspects of the present invention.

Reference herein to “one embodiment” or “an embodiment” means that a particular feature, structure, or characteristic described in connection with the embodiment can be included in at least one embodiment of the invention. The appearances of the phrase “in one embodiment” in various places in the specification are not necessarily all referring to the same embodiment, nor are separate or alternative embodiments mutually exclusive of other embodiments. Further, the order of blocks in process flowcharts or diagrams representing one or more embodiments of the invention do not inherently indicate any particular order nor imply any limitations in the invention.

Referring now to the drawings, in which like numerals refer to like parts throughout the several views. FIG. 1 shows an exemplary configuration 100 in which the present invention may be practiced. The configuration may represent, but not be limited to, a part of a residential home, a business building or a complex with multiple zones. There are a number of multimedia players of which three examples 102, 104 and 106 are shown as audio devices. Each of the audio devices may be installed or provided in one particular area or zone and hence referred to as a zone player herein.

As used herein, unless explicitly stated otherwise, an audio source or audio sources are in digital format and can be transported or streamed over a data network. To facilitate the understanding of the present invention, it is assumed that the configuration 100 represents a home. Thus, the zone player 102 and 104 may be located in two of the bedrooms respectively while the zone player 106 may be installed in a living room. All of the zone players 102, 104 and 106 are coupled directly or indirectly to a data network 108. In addition, a computing device 110 is shown to be coupled on the network 108. In reality, any other devices such as a home gateway device, a storage device, or an MP3 player may be coupled to the network 108 as well.

The network 108 may be a wired network, a wireless network or a combination of both. In one example, all devices including the zone players 102, 104 and 106 are coupled to the network 108 by wireless means based on an industry standard such as IEEE 802.11. In yet another example, all devices including the zone players 102, 104 and 106 are part of a local area network that communicates with a wide area network (e.g., the Internet).

Many devices on the network 108 are configured to download and store audio sources. For example, the computing device 110 can download audio sources from the Internet and store the downloaded sources locally for sharing with other devices on the Internet or the network 108. The computing device 110 or any of the zone players can also be configured to receive streaming audio. Shown as a stereo system, the device 112 is configured to receive an analog audio source (e.g., from broadcasting) or retrieve a digital audio source (e.g., from a compact disk). The analog audio sources can be

US 9,344,206 B2

5

converted to digital audio sources. In accordance with the present invention, the audio source may be shared among the devices on the network **108**.

Two or more zone players may be grouped together to form a new zone group. Any combinations of zone players and an existing zone group may be grouped together. In one instance, a new zone group is formed by adding one zone player to another zone player or an existing zone group.

Referring now to FIG. 2A, there is shown an exemplary functional block diagram of a zone player **200** in accordance with the present invention. The zone player **200** includes a network interface **202**, a processor **204**, a memory **206**, an audio processing circuit **210**, a module **212**, and optionally, an audio amplifier **214** that may be internal or external. The network interface **202** facilitates a data flow between a data network (i.e., the data network **108** of FIG. 1) and the zone player **200** and typically executes a special set of rules (i.e., a protocol) to send data back and forth. One of the common protocols used in the Internet is TCP/IP (Transmission Control Protocol/Internet Protocol). In general, a network interface manages the assembling of an audio source or file into smaller packets that are transmitted over the data network or reassembles received packets into the original source or file. In addition, the network interface **202** handles the address part of each packet so that it gets to the right destination or intercepts packets destined for the zone player **200**.

The network interface **202** may include one or both of a wireless interface **216** and a wired interface **217**. The wireless interface **216**, also referred to as a RF interface, provides network interface functions by a wireless means for the zone player **200** to communicate with other devices in accordance with a communication protocol (such as the wireless standard IEEE 802.11a, 802.11b or 802.11g). The wired interface **217** provides network interface functions by a wired means (e.g., an Ethernet cable). In one embodiment, a zone player includes both of the interfaces **216** and **217**, and other zone players include only a RF or wired interface. Thus these other zone players communicate with other devices on a network or retrieve audio sources via the zone player. The processor **204** is configured to control the operation of other parts in the zone player **200**. The memory **206** may be loaded with one or more software modules that can be executed by the processor **204** to achieve desired tasks. According to one aspect of the present invention, a software module implementing one embodiment of the present invention is executed, the processor **204** operates in accordance with the software module in reference to a saved zone group configuration characterizing a zone group created by a user, the zone player **200** is caused to retrieve an audio source from another zone player or a device on the network.

According to one embodiment of the present invention, the memory **206** is used to save one or more saved zone configuration files that may be retrieved for modification at any time. Typically, a saved zone group configuration file is transmitted to a controller (e.g., the controlling device **140** or **142** of FIG. 1, a computer, a portable device, or a TV) when a user operates the controlling device. The zone group configuration provides an interactive user interface so that various manipulations or control of the zone players may be performed.

The audio processing circuit **210** resembles most of the circuitry in an audio playback device and includes one or more digital-to-analog converters (DAC), an audio preprocessing part, an audio enhancement part or a digital signal processor and others. In operation, when an audio source is retrieved via the network interface **202**, the audio source is processed in the audio processing circuit **210** to produce analog audio signals. The processed analog audio signals are

6

then provided to the audio amplifier **214** for playback on speakers. In addition, the audio processing circuit **210** may include necessary circuitry to process analog signals as inputs to produce digital signals for sharing with other devices on a network.

Depending on an exact implementation, the module **212** may be implemented as a combination of hardware and software. In one embodiment, the module **212** is used to save a scene. The audio amplifier **214** is typically an analog circuit that powers the provided analog audio signals to drive one or more speakers.

Referring now to FIG. 2B, there is shown an exemplary controller **240**, which may correspond to the controlling device **140** or **142** of FIG. 1. The controller **240** may be used to facilitate the control of multi-media applications, automation and others in a complex. In particular, the controller **240** is configured to facilitate a selection of a plurality of audio sources available on the network, controlling operations of one or more zone players (e.g., the zone player **200**) through a RF interface corresponding to the RF interface **216** of FIG. 2A. According to one embodiment, the wireless means is based on an industry standard (e.g., infrared, radio, wireless standard IEEE 802.11a, 802.11b or 802.11g). When a particular audio source is being played in the zone player **200**, a picture, if there is any, associated with the audio source may be transmitted from the zone player **200** to the controller **240** for display. In one embodiment, the controller **240** is used to synchronize more than one zone players by grouping the zone players in a group. In another embodiment, the controller **240** is used to control the volume of each of the zone players in a zone group individually or together.

The user interface for the controller **240** includes a screen **242** (e.g., a LCD screen) and a set of functional buttons as follows: a “zones” button **244**, a “back” button **246**, a “music” button **248**, a scroll wheel **250**, “ok” button **252**, a set of transport control buttons **254**, a mute button **262**, a volume up/down button **264**, a set of soft buttons **266** corresponding to the labels **268** displayed on the screen **242**.

The screen **242** displays various screen menus in response to a user’s selection. In one embodiment, the “zones” button **244** activates a zone management screen or “Zone Menu”, which is described in more details below. The “back” button **246** may lead to different actions depending on the current screen. In one embodiment, the “back” button triggers the current screen display to go back to a previous one. In another embodiment, the “back” button negates the user’s erroneous selection. The “music” button **248** activates a music menu, which allows the selection of an audio source (e.g., a song) to be added to a zone player’s music queue for playback.

The scroll wheel **250** is used for selecting an item within a list, whenever a list is presented on the screen **242**. When the items in the list are too many to be accommodated in one screen display, a scroll indicator such as a scroll bar or a scroll arrow is displayed beside the list. When the scroll indicator is displayed, a user may rotate the scroll wheel **250** to either choose a displayed item or display a hidden item in the list. The “ok” button **252** is used to confirm the user selection on the screen **242**.

There are three transport buttons **254**, which are used to control the effect of the currently playing song. For example, the functions of the transport buttons may include play/pause and forward/rewind a song, move forward to a next song track, or move backward to a previous track. According to one embodiment, pressing one of the volume control buttons such as the mute button **262** or the volume up/down button **264** activates a volume panel. In addition, there are three soft buttons **266** that can be activated in accordance with the labels

US 9,344,206 B2

7

268 on the screen 242. It can be understood that, in a multi-zone system, there may be multiple audio sources being played respectively in more than one zone players. The music transport functions described herein shall apply selectively to one of the sources when a corresponding one of the zone players or zone groups is selected.

FIG. 2C illustrates an internal functional block diagram of an exemplary controller 270, which may correspond to the controller 240 of FIG. 2B. The screen 272 on the controller 270 may be a LCD screen. The screen 272 communicates with and is commanded by a screen driver 274 that is controlled by a microcontroller (e.g., a processor) 276. The memory 282 may be loaded with one or more application modules 284 that can be executed by the microcontroller 276 with or without a user input via the user interface 278 to achieve desired tasks. In one embodiment, an application module is configured to facilitate grouping a number of selected zone players into a zone group and synchronizing the zone players for one audio source. In another embodiment, an application module is configured to control together the audio volumes of the zone players in a zone group. In operation, when the microcontroller 276 executes one of the application modules 284, the screen driver 274 generates control signals to drive the screen 272 to display an application specific user interface accordingly, more of which will be described below.

The controller 270 includes a network interface 280 referred to as a RF interface 280 that facilitates wireless communication with a zone player via a corresponding RF interface thereof. In one embodiment, the commands such as volume control and audio playback synchronization are sent via the RF interfaces. In another embodiment, a saved zone group configuration is transmitted between a zone player and a controller via the RF interfaces. The controller 270 may control one or more zone players, such as 102, 104 and 106 of FIG. 1. Nevertheless, there may be more than one controllers, each preferably in a zone (e.g., a room) and configured to control any one and all of the zone players.

In one embodiment, a user creates a zone group including at least two zone players from the controller 240 that sends signals or data to one of the zone players. As all the zone players are coupled on a network, the received signals in one zone player can cause other zone players in the group to be synchronized so that all the zone players in the group playback an identical audio source or a list of identical audio sources in a timely synchronized manner. Similarly, when a user increases the audio volume of the group from the controller, the signals or data of increasing the audio volume for the group are sent to one of the zone players and causes other zone players in the group to be increased together in volume and in scale.

According to one implementation, an application module is loaded in memory 282 for zone group management. When a predetermined key (e.g. the “zones” button 244) is activated on the controller 240, the application module is executed in the microcontroller 276. The input interface 278 coupled to and controlled by the microcontroller 276 receives inputs from a user. A “Zone Menu” is then displayed on the screen 272. The user may start grouping zone players into a zone group by activating a “Link Zones” or “Add Zone” soft button, or de-grouping a zone group by activating an “Unlink Zones” or “Drop Zone” button. The detail of the zone group manipulation will be further discussed below.

As described above, the input interface 278 includes a number of function buttons as well as a screen graphical user interface. It should be pointed out that the controller 240 in FIG. 2B is not the only controlling device that may practice the present invention. Other devices that provide the equivalent

8

control functions (e.g., a computing device, a hand-held device) may also be configured to practice the present invention. In the above description, unless otherwise specifically described, it is clear that keys or buttons are generally referred to as either the physical buttons or soft buttons, enabling a user to enter a command or data.

One mechanism for ‘joining’ zone players together for music playback is to link a number of zone players together to form a group. To link a number of zone players together, a user may manually link each zone player or room one after the other. For example, there is a multi-zone system that includes the following zones.

Bathroom
Bedroom
Den
Dining Room
Family Room
Foyer

If the user wishes to link 5 of the 6 zone players using the current mechanism, he/she must start with a single zone and then manually link each zone to that zone. This mechanism may be sometimes quite time consuming. According to one embodiment, a set of zones can be dynamically linked together using one command. Using what is referred to herein as a theme or a zone scene, zones can be configured in a particular scene (e.g., morning, afternoon, or garden), where a predefined zone grouping and setting of attributes for the grouping are automatically effectuated.

For instance, a “Morning” zone scene/configuration command would link the Bedroom, Den and Dining Room together in one action. Without this single command, the user would need to manually and individually link each zone. FIG. 3A provides an illustration of one zone scene, where the left column shows the starting zone grouping—all zones are separate, the column on the right shows the effects of grouping the zones to make a group of 3 zones named after “Morning”.

Expanding this idea further, a Zone Scene can be set to create multiple sets of linked zones. For example, a scene creates 3 separate groups of zones, the downstairs zones would be linked together, the upstairs zones would be linked together in their own group, and the outside zones (in this case the patio) would move into a group of its own.

In one embodiment as shown in FIG. 3B, a user defines multiple groups to be gathered at the same time. For example: an “Evening Scene” is desired to link the following zones:

Group 1
Bedroom
Den
Dining Room
Group 2
Garage
Garden

where Bathroom, Family Room and Foyer should be separated from any group if they were part of a group before the Zone Scene was invoked.

One important of the features, benefits and objects in the present invention is that that zones do not need to be separated before a zone scene is invoked. In one embodiment, a command is provided and links all zones in one step, if invoked. The command is in a form of a zone scene. After linking the appropriate zones, a zone scene command could apply the following attributes:

Set volumes levels in each zones (each zone can have a different volume) Mute/Unmute zones.
Select and play specific music in the zones.
Set the play mode of the music (Shuffle, Repeat, Shuffle-repeat)

US 9,344,206 B2

9

Set the music playback equalization of each zone (e.g., bass treble).

A further extension of this embodiment is to trigger a zone scene command as an alarm clock function. For instance the zone scene is set to apply at 8:00 am. It could link appropriate zones automatically, set specific music to play and then stop the music after a defined duration. Although a single zone may be assigned to an alarm, a scene set as an alarm clock provides a synchronized alarm, allowing any zones linked in the scene to play a predefined audio (e.g., a favorable song, a predefined playlist) at a specific time or for a specific duration. If, for any reason, the scheduled music failed to be played (e.g., an empty playlist, no connection to a share, failed UPnP, no Internet connection for an Internet Radio station), a backup buzzer will sound. This buzzer will be a sound file that is stored in a zone player.

FIG. 4 shows an exemplary user interface 400 that may be displayed on a controller 142 or a computer 110 of FIG. 1. The interface 400 shows a list of items that may be set up by a user to cause a scene to function at a specific time. In the embodiment shown in FIG. 4, the list of items includes "Alarm", "Time", "Zone", "Music", "Frequency" and "Alarm length". "Alarm" can be set on or off. When "Alarm" is set on, "Time" is a specific time to set off the alarm. "Zone" shows which zone players are being set to play a specified audio at the specific time. "Music" shows what to be played when the specific time arrives. "Frequency" allows the user to define a frequency of the alarm. "Alarm length" defines how long the audio is to be played. It should be noted that the user interface 400 is provided herein to show some of the functions associated with setting up an alarm. Depending on an exact implementation, other functions, such as time zone, daylight savings, time synchronization, and time/date format for display may also be provided without departing from the present invention.

According to one embodiment, each zone player in a scene may be set up for different alarms. For example, a "Morning" scene includes three zone players, each in a bedroom, a den, and a dining room. After selecting the scene, the user may set up an alarm for the scene as whole. As a result, each of the zone players will be activated at a specific time.

FIG. 5A shows a user interface 500 to allow a user to form a scene. The panel on the left shows the available zones in a household. The panel on the right shows the zones that have been selected and be grouped as part of this scene. Depending on an exact implementation of a user interface, Add/Remove buttons may be provided to move zones between the panels, or zones may be dragged along between panels.

FIG. 5B shows another user interface 520 to allow a user to form a scene. The user interface 520 that may be displayed on a controller or a computing device, lists available zones in a system. A checkbox is provide next to each of the zones so that a user may check in the zones to be associated with the scene.

FIG. 5C shows a user interface 510 to allow a user to adjust a volume level of the zone players in a zone scene individually or collectively. As shown in the user interface 510, the "Volumes . . ." button (shown as sliders, other forms are possible) allows the user to affect the volumes of the associated zone players when a zone scene is invoked. In one embodiment, the zone players can be set to retain whatever volume that they currently have when the scene is invoked. Additionally the user can decide if the volumes should be unmuted or muted when the scene is invoked.

FIG. 6 shows a flowchart or process 600 of providing a player theme or a zone scene for a plurality of players, where one or more of the players are placed in a zone. The process

10

600 is presented in accordance with one embodiment of the present invention and may be implemented in a module to be located in the memory 282 of FIG. 2C.

The process 600 is initiated only when a user decides to proceed with a zone scene at 602. The process 600 then moves to 604 where it allows a user to decide which zone players to be associated with the scene. For example, there are ten players in a household, and the scene is named after "Morning". The user may be given an interface to select four of the ten players to be associated with the scene. At 606, the scene is saved. The scene may be saved in any one of the members in the scene. In the example of FIG. 1, the scene is saved in one of the zone players and displayed on the controller 142. In operation, a set of data pertaining to the scene includes a plurality of parameters. In one embodiment, the parameters include, but may not be limited to, identifiers (e.g., IP address) of the associated players and a playlist. The parameters may also include volume/tone settings for the associated players in the scene. The user may go back to 602 to configure another scene if desired.

Given a saved scene, a user may activate the scene at any time or set up a timer to activate the scene at 610. The process 600 can continue when a saved scene is activated at 610. At 612, upon the activation of a saved scene, the process 600 checks the status of the players associated with the scene. The status of the players means that each of the players shall be in condition to react in a synchronized manner. In one embodiment, the interconnections of the players are checked to make sure that the players communicate among themselves and/or with a controller if there is such a controller in the scene.

It is assumed that all players associated with the scene are in good condition. At 614, commands are executed with the parameters (e.g., pertaining to a playlist and volumes). In one embodiment, data including the parameters is transported from a member (e.g., a controller) to other members in the scene so that the players are caused to synchronize an operation configured in the scene. The operation may cause all players to play back a song in identical or different volumes or to play back a pre-stored file.

One of the features, benefits and advantages in the present invention is to allow sets of related devices (controllers and operating components) to exist as a group without interfering with other components that are potentially visible on the same wired or wireless network. Each of the sets is configured to a theme or a scene.

The present invention has been described in sufficient detail with a certain degree of particularity. It is understood to those skilled in the art that the present disclosure of embodiments has been made by way of examples only and that numerous changes in the arrangement and combination of parts may be resorted without departing from the spirit and scope of the invention as claimed. While the embodiments discussed herein may appear to include some limitations as to the presentation of the information units, in terms of the format and arrangement, the invention has applicability well beyond such embodiment, which can be appreciated by those skilled in the art. Accordingly, the scope of the present invention is defined by the appended claims rather than the foregoing description of embodiments.

The invention claimed is:

1. A multimedia controller including a processor, the controller configured to:

receive, via a network interface, a zone configuration from a first independent playback device of a plurality of independent playback devices, wherein the zone configuration is configured via the controller and maintained at the first independent playback device, and

US 9,344,206 B2

11

wherein the zone configuration characterizes one or more zone scenes, each zone scene identifying a group configuration associated with two or more of the plurality of independent playback devices; and

cause a selectable indication of the received zone configuration to be displayed, wherein the displayed selectable indication is selectable to cause one or more of the zone scenes to be invoked by two or more of the plurality of independent playback devices.

2. The multimedia controller of claim 1, wherein causing the selectable indication of the received zone configuration to be displayed comprises causing an indication of at least one of the one or more zone scenes to be displayed.

3. The multimedia controller of claim 2, wherein causing the selectable indication of the at least one of the one or more zone scenes to be displayed comprises displaying an indication of the group configuration identified by the at least one of the one or more zone scenes to be displayed.

4. The multimedia controller of claim 3, wherein the indication of the group configuration identified by the at least one of the one or more zone scenes comprises one group of independent playback devices.

5. The multimedia controller of claim 4, further configured to:

after causing the indication of the received zone configuration to be displayed, cause one of the at least one of the one or more zone scenes to be activated.

6. The multimedia controller of claim 3, wherein the indication of the group configuration identified by the at least one of the one or more zone scenes comprises two or more groups of independent playback devices.

7. The multimedia controller claim 1, further configured to: before receiving the zone configuration, send, to one of the plurality of independent playback devices, a command to save at least one of the one or more zone scenes.

8. The multimedia controller of claim 7, wherein the command to save at least one of the one or more zone scenes includes, for each of the at least one or more zone scenes, (a) an indication of the two or more of the plurality of independent playback devices identified by the zone scene and (b) at least one other parameter pertaining to the scene.

9. The multimedia controller of claim 8, wherein the at least one other parameter pertaining to the scene is one or more of (i) a volume level, (ii) a specific music, (iii) a play mode, or (iv) an equalization.

10. The multimedia controller of claim 1, further configured to:

after causing the selectable indication of the received zone configuration to be displayed, cause at least one of the one or more zone scenes to be activated.

11. The multimedia controller of claim 1, wherein each of the one or more zone scenes is associated with a name.

12. In a network comprising a plurality of independent playback devices, a method comprising:

receiving, via the network by a controller device, a zone configuration from a first independent playback device of a plurality of independent playback devices, wherein the zone configuration is configured via the controller and maintained at the first independent playback device,

12

and wherein the zone configuration characterizes one or more zone scenes, each zone scene identifying a group configuration associated with two or more of the plurality of independent playback devices; and

causing, by the controller device, a selectable indication of the received zone configuration to be displayed, wherein the displayed selectable indication is selectable to cause one or more of the zone scenes to be invoked by two or more of the plurality of independent playback devices.

13. The method of claim 12, wherein causing the selectable indication of the received zone configuration to be displayed comprises causing an indication of at least one of the one or more zone scenes to be displayed.

14. The method of claim 13, wherein causing the selectable indication of the at least one of the one or more zone scenes to be displayed comprises displaying an indication of the group configuration identified by the at least one of the one or more zone scenes to be displayed.

15. The method of claim 12, further comprising:

before receiving the zone configuration, sending, to one of the plurality of independent playback devices, a command to save at least one of the one or more zone scenes.

16. The method of claim 12, further comprising:

after causing the selectable indication of the received zone configuration to be displayed, causing, by the controller device, at least one of the one or more zone scenes to be activated.

17. A non-transitory computer-readable storage medium including a set of instructions for execution by a processor, the set of instructions, when executed, implement a controller configured to:

receive, via a network interface, a zone configuration from a first independent playback device of a plurality of independent playback devices, wherein the zone configuration is configured via the controller and maintained at the first independent playback device, and wherein the zone configuration characterizes one or more zone scenes, each zone scene identifying a group configuration associated with two or more of the plurality of independent playback devices; and

cause a selectable indication of the received zone configuration to be displayed, wherein the displayed selectable indication is selectable to cause one or more of the zone scenes to be invoked by two or more of the plurality of independent playback devices.

18. The computer-readable medium of claim 17, wherein causing the selectable indication of the received zone configuration to be displayed comprises causing an indication of at least one of the one or more zone scenes to be displayed.

19. The computer readable medium of claim 17, wherein causing the selectable indication of the at least one of the one or more zone scenes to be displayed comprises displaying an indication of the group configuration identified by the at least one of the one or more zone scenes to be displayed.

20. The computer readable medium of claim 19, wherein the indication of the group configuration identified by the at least one of the one or more zone scenes comprises two or more groups of independent playback devices.

* * * * *

EXHIBIT 4

(12) **United States Patent**
Lambourne

(10) **Patent No.:** **US 10,469,966 B2**
(45) **Date of Patent:** **Nov. 5, 2019**

(54) **ZONE SCENE MANAGEMENT**

(56) **References Cited**

(71) Applicant: **SONOS, INC.**, Santa Barbara, CA (US)

U.S. PATENT DOCUMENTS

(72) Inventor: **Robert A. Lambourne**, Santa Barbara, CA (US)

3,956,591 A 5/1976 Gates, Jr.
4,105,974 A 8/1978 Rogers
(Continued)

(73) Assignee: **Sonos, Inc.**, Santa Barbara, CA (US)

FOREIGN PATENT DOCUMENTS

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

CA 2320451 A1 3/2001
CN 1598767 A 3/2005
(Continued)

(21) Appl. No.: **16/383,565**

OTHER PUBLICATIONS

(22) Filed: **Apr. 12, 2019**

Yamaha DME Designer 3.5 user manual (Year: 2004).
(Continued)

(65) **Prior Publication Data**

US 2019/0239009 A1 Aug. 1, 2019

Primary Examiner — Paul C McCord

Related U.S. Application Data

(63) Continuation of application No. 15/130,919, filed on Apr. 15, 2016, which is a continuation of application (Continued)

(51) **Int. Cl.**

G06F 17/00 (2019.01)

H04R 27/00 (2006.01)

(Continued)

(52) **U.S. Cl.**

CPC **H04R 27/00** (2013.01); **G05B 15/02** (2013.01); **G06F 3/0482** (2013.01);
(Continued)

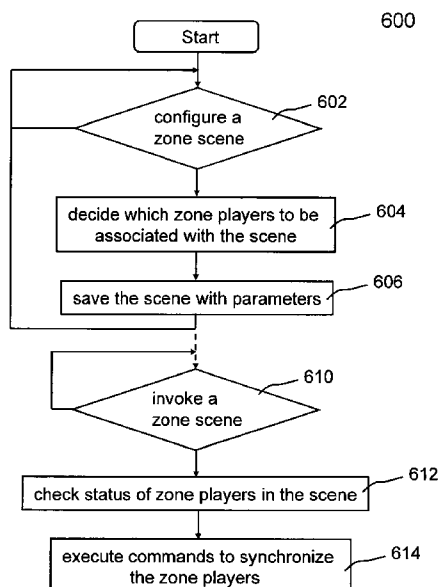
(58) **Field of Classification Search**

CPC H04R 27/00; H04R 3/12; H04R 2227/005;
H04R 2430/01; G05B 15/02;
(Continued)

(57) **ABSTRACT**

An example computing device in a media playback system receives a first request to create a first zone scene including a first preconfigured grouping of zones including a first zone and a second zone, and based on the first request, causes creation and storage of the first zone scene. The computing device receives a second request to create a second zone scene including a second preconfigured grouping of zones including the first zone and a third zone, and based on the second request, causes creation and storage of the second zone scene. While displaying a representation of the first zone scene and a representation of the second zone scene, the computing device receives a third request to invoke the first zone scene, and based on the third request, causes the first zone scene to be invoked such that the first zone and the second zone become configured for synchronous playback of media.

20 Claims, 13 Drawing Sheets



US 10,469,966 B2

Page 2

Related U.S. Application Data

- No. 14/465,457, filed on Aug. 21, 2014, now Pat. No. 9,344,206, which is a continuation of application No. 13/896,829, filed on May 17, 2013, now Pat. No. 8,843,228, which is a continuation of application No. 11/853,790, filed on Sep. 11, 2007, now Pat. No. 8,483,853.
- (60) Provisional application No. 60/825,407, filed on Sep. 12, 2006.
- (51) **Int. Cl.**
G05B 15/02 (2006.01)
H04N 21/436 (2011.01)
H04R 3/12 (2006.01)
G06F 3/16 (2006.01)
H03G 7/00 (2006.01)
G06F 3/0482 (2013.01)
G06F 3/0484 (2013.01)
H03G 1/02 (2006.01)
H04H 60/80 (2008.01)
- (52) **U.S. Cl.**
CPC **G06F 3/04842** (2013.01); **G06F 3/16** (2013.01); **G06F 3/165** (2013.01); **H03G 1/02** (2013.01); **H03G 7/00** (2013.01); **H04H 60/80** (2013.01); **H04N 21/43615** (2013.01); **H04R 3/12** (2013.01); **H04R 2227/005** (2013.01); **H04R 2430/01** (2013.01)
- (58) **Field of Classification Search**
CPC G06F 3/0482; G06F 3/04842; G06F 3/16; G06F 3/165; H03G 1/02; H03G 7/00; H04H 60/80; H04N 21/43615
USPC 700/94
See application file for complete search history.
- (56) **References Cited**
U.S. PATENT DOCUMENTS
- | | | | | | | | |
|-----------|---|---------|-----------------|-----------|---|---------|-------------------|
| D260,764 | S | 9/1981 | Castagna et al. | 5,185,680 | A | 2/1993 | Kakubo |
| 4,296,278 | A | 10/1981 | Cullison et al. | 5,237,327 | A | 8/1993 | Saitoh et al. |
| 4,306,114 | A | 12/1981 | Callahan | 5,239,458 | A | 8/1993 | Suzuki |
| 4,382,158 | A | 5/1983 | Ohshita et al. | 5,272,757 | A | 12/1993 | Scotfield et al. |
| 4,509,211 | A | 4/1985 | Robbins | 5,299,266 | A | 3/1994 | Lumsden |
| D279,779 | S | 7/1985 | Taylor | D350,531 | S | 9/1994 | Tsuji |
| 4,530,091 | A | 7/1985 | Crockett | D350,962 | S | 9/1994 | Reardon et al. |
| 4,696,037 | A | 9/1987 | Fierens | 5,361,381 | A | 11/1994 | Short |
| 4,701,629 | A | 10/1987 | Citroen | 5,372,441 | A | 12/1994 | Louis |
| 4,712,105 | A | 12/1987 | Kohler | D354,059 | S | 1/1995 | Hendricks |
| D293,671 | S | 1/1988 | Beaumont | D354,751 | S | 1/1995 | Hersh et al. |
| 4,731,814 | A | 3/1988 | Becker et al. | D356,093 | S | 3/1995 | McCauley et al. |
| 4,816,989 | A | 3/1989 | Finn et al. | D356,312 | S | 3/1995 | Althans |
| 4,824,059 | A | 4/1989 | Butler | D357,024 | S | 4/1995 | Tokiyama et al. |
| D301,037 | S | 5/1989 | Matsuda | 5,406,634 | A | 4/1995 | Anderson et al. |
| 4,845,751 | A | 7/1989 | Schwab | 5,430,485 | A | 7/1995 | Lankford et al. |
| D304,443 | S | 11/1989 | Grinyer et al. | 5,440,644 | A | 8/1995 | Farinelli et al. |
| D313,023 | S | 12/1990 | Kolenda et al. | D362,446 | S | 9/1995 | Gasiorek et al. |
| D313,398 | S | 1/1991 | Gilchrist | 5,457,448 | A | 10/1995 | Totsuka et al. |
| D313,600 | S | 1/1991 | Weber | D363,933 | S | 11/1995 | Starck |
| 4,994,908 | A | 2/1991 | Kuban et al. | 5,467,342 | A | 11/1995 | Logston et al. |
| 4,995,778 | A | 2/1991 | Bruessel | D364,877 | S | 12/1995 | Tokiyama et al. |
| D320,598 | S | 10/1991 | Auerbach et al. | D364,878 | S | 12/1995 | Green et al. |
| D322,609 | S | 12/1991 | Patton | D365,102 | S | 12/1995 | Gioscia |
| 5,086,385 | A | 2/1992 | Launey et al. | D366,044 | S | 1/1996 | Hara et al. |
| D326,450 | S | 5/1992 | Watanabe | 5,481,251 | A | 1/1996 | Buys et al. |
| D327,060 | S | 6/1992 | Wachob et al. | 5,491,839 | A | 2/1996 | Schotz |
| 5,151,922 | A | 9/1992 | Weiss | 5,515,345 | A | 5/1996 | Barreira et al. |
| 5,153,579 | A | 10/1992 | Fisch et al. | 5,519,641 | A | 5/1996 | Beers et al. |
| D331,388 | S | 12/1992 | Dahnert et al. | 5,533,021 | A | 7/1996 | Branstad et al. |
| 5,182,552 | A | 1/1993 | Paynting | D372,716 | S | 8/1996 | Thorne |
| D333,135 | S | 2/1993 | Wachob et al. | 5,553,147 | A | 9/1996 | Pineau |
| | | | | 5,553,222 | A | 9/1996 | Milne et al. |
| | | | | 5,553,314 | A | 9/1996 | Grube et al. |
| | | | | D377,651 | S | 1/1997 | Biasotti et al. |
| | | | | 5,596,696 | A | 1/1997 | Tindell et al. |
| | | | | 5,602,992 | A | 2/1997 | Danneels |
| | | | | 5,623,483 | A | 4/1997 | Agrawal et al. |
| | | | | 5,625,350 | A | 4/1997 | Fukatsu et al. |
| | | | | D379,816 | S | 6/1997 | Laituri et al. |
| | | | | 5,640,388 | A | 6/1997 | Woodhead et al. |
| | | | | D380,752 | S | 7/1997 | Hanson |
| | | | | 5,652,749 | A | 7/1997 | Davenport et al. |
| | | | | D382,271 | S | 8/1997 | Akwiwu |
| | | | | 5,661,665 | A | 8/1997 | Glass et al. |
| | | | | 5,668,884 | A | 9/1997 | Clair, Jr. et al. |
| | | | | 5,673,323 | A | 9/1997 | Schotz et al. |
| | | | | D384,940 | S | 10/1997 | Kono et al. |
| | | | | D387,352 | S | 12/1997 | Kaneko et al. |
| | | | | 5,696,896 | A | 12/1997 | Badovinatz et al. |
| | | | | D388,792 | S | 1/1998 | Nykerk |
| | | | | D389,143 | S | 1/1998 | Wicks |
| | | | | D392,641 | S | 3/1998 | Fenner |
| | | | | 5,726,989 | A | 3/1998 | Dokic |
| | | | | D393,628 | S | 4/1998 | Ledbetter et al. |
| | | | | 5,740,235 | A | 4/1998 | Lester et al. |
| | | | | 5,742,623 | A | 4/1998 | Nuber et al. |
| | | | | D394,659 | S | 5/1998 | Biasotti et al. |
| | | | | 5,751,819 | A | 5/1998 | Dorough |
| | | | | 5,761,320 | A | 6/1998 | Farinelli et al. |
| | | | | 5,774,016 | A | 6/1998 | Ketterer |
| | | | | D395,889 | S | 7/1998 | Gerba et al. |
| | | | | 5,787,249 | A | 7/1998 | Badovinatz et al. |
| | | | | 5,790,543 | A | 8/1998 | Cloutier |
| | | | | D397,996 | S | 9/1998 | Smith |
| | | | | 5,808,662 | A | 9/1998 | Kinney et al. |
| | | | | 5,812,201 | A | 9/1998 | Yoo |
| | | | | 5,815,689 | A | 9/1998 | Shaw et al. |
| | | | | 5,818,948 | A | 10/1998 | Gulick |
| | | | | D401,587 | S | 11/1998 | Rudolph |
| | | | | 5,832,024 | A | 11/1998 | Schotz et al. |
| | | | | 5,848,152 | A | 12/1998 | Slipy et al. |
| | | | | 5,852,722 | A | 12/1998 | Hamilton |
| | | | | D404,741 | S | 1/1999 | Schumaker et al. |
| | | | | D405,071 | S | 2/1999 | Gambaro |
| | | | | 5,867,691 | A | 2/1999 | Shiraishi |
| | | | | 5,875,233 | A | 2/1999 | Cox |
| | | | | 5,875,354 | A | 2/1999 | Charlton et al. |
| | | | | D406,847 | S | 3/1999 | Gerba et al. |

US 10,469,966 B2

Page 3

(56)

References Cited

U.S. PATENT DOCUMENTS

D407,071	S	3/1999	Keating	6,430,353	B1	8/2002	Honda et al.
5,887,143	A	3/1999	Saito et al.	6,442,443	B1	8/2002	Fujii et al.
5,905,768	A	5/1999	Maturi et al.	D462,339	S	9/2002	Allen et al.
D410,927	S	6/1999	Yamagishi	D462,340	S	9/2002	Allen et al.
5,910,991	A	6/1999	Farrar	D462,945	S	9/2002	Skulley
D412,337	S	7/1999	Hamano	6,449,642	B2	9/2002	Bourke-Dunphy et al.
5,923,869	A	7/1999	Kashiwagi et al.	6,449,653	B2	9/2002	Klemets et al.
5,923,902	A	7/1999	Inagaki	6,456,783	B1	9/2002	Ando et al.
5,946,343	A	8/1999	Schotz et al.	6,463,474	B1	10/2002	Fuh et al.
5,956,025	A	9/1999	Goulden et al.	6,466,832	B1	10/2002	Zuqert et al.
5,956,088	A	9/1999	Shen et al.	6,469,633	B1	10/2002	Wachter et al.
5,960,006	A	9/1999	Maturi et al.	D466,108	S	11/2002	Glodava et al.
D415,496	S	10/1999	Gerba et al.	6,487,296	B1	11/2002	Allen et al.
D416,021	S	11/1999	Godette et al.	6,493,832	B1	12/2002	Itakura et al.
5,984,512	A	11/1999	Jones et al.	D468,297	S	1/2003	Ikeda
5,987,611	A	11/1999	Freund	6,522,886	B1	2/2003	Youngs et al.
5,990,884	A	11/1999	Douma et al.	6,526,325	B1	2/2003	Sussman et al.
5,991,307	A	11/1999	Komuro et al.	6,535,121	B2	3/2003	Matheny et al.
5,999,906	A	12/1999	Merces et al.	D474,763	S	5/2003	Tozaki et al.
6,009,457	A	12/1999	Moller	D475,993	S	6/2003	Meyer
6,018,376	A	1/2000	Nakatani	D476,643	S	7/2003	Yamagishi
D420,006	S	2/2000	Tonino	D477,310	S	7/2003	Moransais
6,026,150	A	2/2000	Frank et al.	6,587,127	B1	7/2003	Leeke et al.
6,029,196	A	2/2000	Lenz	6,598,172	B1	7/2003	Vandeusen et al.
6,031,818	A	2/2000	Lo et al.	D478,051	S	8/2003	Sagawa
6,032,202	A	2/2000	Lea et al.	D478,069	S	8/2003	Beck et al.
6,038,614	A	3/2000	Chan et al.	D478,896	S	8/2003	Summers
6,046,550	A	4/2000	Ference et al.	6,604,023	B1	8/2003	Brown et al.
6,061,457	A	5/2000	Stockhamer	6,611,537	B1	8/2003	Edens et al.
6,078,725	A	6/2000	Tanaka	D479,520	S	9/2003	De
6,081,266	A	6/2000	Sciammarella	D481,056	S	10/2003	Kawasaki et al.
6,088,063	A	7/2000	Shiba	6,631,410	B1	10/2003	Kowalski et al.
D429,246	S	8/2000	Holma	6,636,269	B1	10/2003	Baldwin
D430,143	S	8/2000	Renk	6,653,899	B2	11/2003	Organvidez et al.
6,101,195	A	8/2000	Lyons et al.	6,654,720	B1	11/2003	Graham et al.
6,108,485	A	8/2000	Kim	6,654,956	B1	11/2003	Trinh et al.
6,108,686	A	8/2000	Williams, Jr.	6,658,091	B1	12/2003	Naidoo et al.
6,122,668	A	9/2000	Teng et al.	6,674,803	B1	1/2004	Kesselring
D431,552	S	10/2000	Backs et al.	6,684,060	B1	1/2004	Curtin
D432,525	S	10/2000	Beecroft	D486,145	S	2/2004	Kaminski et al.
6,127,941	A	10/2000	Van Ryzin	6,687,664	B1	2/2004	Sussman et al.
6,128,318	A	10/2000	Sato	6,704,421	B1	3/2004	Kitamura
6,148,205	A	11/2000	Cotton	6,741,961	B2	5/2004	Lim
6,157,957	A	12/2000	Berthaud	D491,925	S	6/2004	Griesau et al.
6,163,647	A	12/2000	Terashima et al.	6,757,517	B2	6/2004	Chang et al.
6,169,725	B1	1/2001	Gibbs et al.	D493,148	S	7/2004	Shibata et al.
6,175,872	B1	1/2001	Neumann et al.	6,763,274	B1	7/2004	Gilbert
6,181,383	B1	1/2001	Fox et al.	D495,333	S	8/2004	Borsboom
6,185,737	B1	2/2001	Northcutt et al.	6,778,073	B2	8/2004	Lutter et al.
6,195,435	B1	2/2001	Kitamura	6,778,493	B1	8/2004	Ishii
6,195,436	B1	2/2001	Scibora et al.	6,778,869	B2	8/2004	Champion
6,199,169	B1	3/2001	Voth	D496,003	S	9/2004	Spira
6,212,282	B1	4/2001	Mershon	D496,005	S	9/2004	Wang
6,246,701	B1	6/2001	Slattery	D496,335	S	9/2004	Spira
6,253,293	B1	6/2001	Rao et al.	D497,363	S	10/2004	Olson et al.
D444,475	S	7/2001	Levey et al.	6,803,964	B1	10/2004	Post et al.
6,255,961	B1	7/2001	Van et al.	6,809,635	B1	10/2004	Kaaresoja
6,256,554	B1	7/2001	Dilorenzo	D499,086	S	11/2004	Polito
6,269,406	B1	7/2001	Dutcher et al.	6,816,510	B1	11/2004	Banerjee
6,301,012	B1	10/2001	White et al.	6,816,818	B2	11/2004	Wolf et al.
6,308,207	B1	10/2001	Tseng et al.	6,823,225	B1	11/2004	Sass
6,310,652	B1	10/2001	Li et al.	6,826,283	B1	11/2004	Wheeler et al.
6,313,879	B1	11/2001	Kubo et al.	D499,395	S	12/2004	Hsu
6,321,252	B1	11/2001	Bhola et al.	D499,718	S	12/2004	Chen
6,324,586	B1	11/2001	Johnson	D500,015	S	12/2004	Gubbe
D452,520	S	12/2001	Gotham et al.	6,836,788	B2	12/2004	Kim et al.
6,332,147	B1	12/2001	Moran et al.	6,839,752	B1	1/2005	Miller et al.
6,343,028	B1	1/2002	Kuwaoka	D501,477	S	2/2005	Hall
6,349,285	B1	2/2002	Liu et al.	6,859,460	B1	2/2005	Chen
6,349,339	B1	2/2002	Williams	6,859,538	B1	2/2005	Voltz
6,351,821	B1	2/2002	Voth	6,873,862	B2	3/2005	Reshefsky
6,353,172	B1	3/2002	Fay et al.	6,882,335	B2	4/2005	Saarinan
6,356,871	B1	3/2002	Hemkumar et al.	D504,872	S	5/2005	Uehara et al.
6,404,811	B1	6/2002	Cvetko et al.	D504,885	S	5/2005	Zhang et al.
6,418,150	B1	7/2002	Staats	6,889,207	B2	5/2005	Slemmer et al.
				6,898,642	B2	5/2005	Chafle et al.
				6,901,439	B1	5/2005	Bonasia et al.
				D506,463	S	6/2005	Daniels
				6,907,458	B2	6/2005	Tomassetti et al.

US 10,469,966 B2

Page 4

(56)

References Cited

U.S. PATENT DOCUMENTS

6,912,610 B2	6/2005	Spencer	7,333,519 B2	2/2008	Sullivan et al.
6,915,347 B2	7/2005	Hanko et al.	7,346,332 B2	3/2008	McCarty et al.
6,916,980 B2	7/2005	Ishida et al.	7,356,011 B1	4/2008	Waters et al.
6,917,592 B1	7/2005	Ramankutty et al.	7,359,006 B1	4/2008	Xiang et al.
6,919,771 B2	7/2005	Nakajima	7,366,206 B2	4/2008	Lockridge et al.
6,920,373 B2	7/2005	Xi et al.	7,372,846 B2	5/2008	Zwack
6,931,134 B1	8/2005	Waller, Jr. et al.	7,391,791 B2	6/2008	Balassanian et al.
6,931,557 B2	8/2005	Togawa	7,392,102 B2	6/2008	Sullivan et al.
6,934,766 B1	8/2005	Russell	7,392,481 B2	6/2008	Gewickey et al.
6,937,988 B1	8/2005	Hemkumar et al.	7,400,644 B2	7/2008	Sakamoto et al.
6,970,482 B2	11/2005	Kim	7,412,499 B2	8/2008	Chang et al.
6,985,694 B1	1/2006	De Bonet et al.	7,424,267 B2	9/2008	Eisenbach
6,987,767 B2	1/2006	Saito	7,428,310 B2	9/2008	Park
6,987,947 B2	1/2006	Richenstein et al.	7,430,181 B1	9/2008	Hong
D515,072 S	2/2006	Lee	7,457,948 B1	11/2008	Bilicksa et al.
D515,557 S	2/2006	Okuley	7,472,058 B2	12/2008	Tseng et al.
7,007,106 B1	2/2006	Flood et al.	7,474,677 B2	1/2009	Trott
7,020,791 B1	3/2006	Aweya et al.	7,483,538 B2	1/2009	McCarty et al.
D518,475 S	4/2006	Yang et al.	7,483,540 B2	1/2009	Rabinowitz et al.
7,043,477 B2	5/2006	Mercer et al.	7,483,958 B1	1/2009	Elabbady et al.
7,043,651 B2	5/2006	Aweya et al.	7,490,044 B2	2/2009	Kulkarni
7,046,677 B2	5/2006	Monta et al.	7,492,912 B2	2/2009	Chung et al.
7,047,308 B2	5/2006	Deshpande	7,505,889 B2	3/2009	Salmonsens et al.
7,054,888 B2	5/2006	Lachapelle et al.	7,509,181 B2	3/2009	Champion
7,058,889 B2	6/2006	Trovato et al.	7,519,188 B2	4/2009	Berardi et al.
7,068,596 B1	6/2006	Mou	7,519,667 B1	4/2009	Capps
D524,296 S	7/2006	Kita	7,539,551 B2	5/2009	Komura et al.
7,072,477 B1	7/2006	Kincaid	7,548,744 B2	6/2009	Oesterling et al.
D527,375 S	8/2006	Flora et al.	7,548,851 B1	6/2009	Lau et al.
7,092,528 B2	8/2006	Patrick et al.	7,558,224 B1	7/2009	Surazski et al.
7,092,694 B2	8/2006	Griep et al.	7,558,635 B1	7/2009	Thiel et al.
7,096,169 B2	8/2006	Crutchfield et al.	7,561,932 B1	7/2009	Holmes et al.
7,113,999 B2	9/2006	Pestoni et al.	7,571,014 B1	8/2009	Lambourne et al.
7,115,017 B1	10/2006	Laursen et al.	7,574,274 B2	8/2009	Holmes
7,120,168 B2	10/2006	Zimmermann	7,599,685 B2	10/2009	Goldberg et al.
7,130,316 B2	10/2006	Kovacevic	7,606,174 B2	10/2009	Ochi et al.
7,130,368 B1	10/2006	Aweya et al.	7,620,468 B2	11/2009	Shimizu
7,130,608 B2	10/2006	Hollstrom et al.	7,626,952 B2	12/2009	Slemmer et al.
7,130,616 B2	10/2006	Janik	7,627,825 B2	12/2009	Kakuda
7,136,934 B2	11/2006	Carter et al.	7,630,500 B1	12/2009	Beckman et al.
7,139,981 B2	11/2006	Mayer et al.	7,630,501 B2	12/2009	Blank et al.
7,143,141 B1	11/2006	Morgan et al.	7,631,119 B2	12/2009	Moore et al.
7,143,939 B2	12/2006	Henzerling	7,643,894 B2	1/2010	Braithwaite et al.
7,146,260 B2	12/2006	Preston et al.	7,653,344 B1	1/2010	Feldman et al.
7,158,488 B2	1/2007	Fujimori	7,657,224 B2	2/2010	Goldberg et al.
7,161,939 B2	1/2007	Israel et al.	7,657,644 B1	2/2010	Zheng
7,162,315 B2	1/2007	Gilbert	7,657,910 B1	2/2010	McAulay et al.
7,171,010 B2	1/2007	Martin et al.	7,665,115 B2	2/2010	Gallo et al.
7,185,090 B2	2/2007	Kowalski et al.	7,668,990 B2	2/2010	Krzyzanowski et al.
7,187,947 B1	3/2007	White et al.	7,669,113 B1	2/2010	Moore et al.
7,197,148 B2	3/2007	Nourse et al.	7,669,219 B2	2/2010	Scott, III
7,206,367 B1	4/2007	Moore et al.	7,672,470 B2	3/2010	Lee
7,206,618 B2	4/2007	Latto et al.	7,675,943 B2	3/2010	Mosig et al.
7,206,967 B1	4/2007	Marti et al.	7,676,044 B2	3/2010	Sasaki et al.
7,209,795 B2	4/2007	Sullivan et al.	7,676,142 B1	3/2010	Hung
7,218,708 B2	5/2007	Berezowski	7,688,306 B2	3/2010	Wehrenberg et al.
7,236,739 B2	6/2007	Chang et al.	7,689,304 B2	3/2010	Sasaki
7,236,773 B2	6/2007	Thomas	7,689,305 B2	3/2010	Kreifeldt et al.
7,257,398 B1	8/2007	Ukita et al.	7,702,279 B2	4/2010	Ko et al.
7,260,616 B1	8/2007	Cook	7,702,403 B1	4/2010	Gladwin et al.
7,263,110 B2	8/2007	Fujihiro	7,710,941 B2	5/2010	Rietschel et al.
7,277,547 B1	10/2007	Delker et al.	7,711,774 B1	5/2010	Rothschild
7,286,652 B1	10/2007	Azriel et al.	7,720,096 B2	5/2010	Klemets
7,289,631 B2	10/2007	Ishidoshiro	7,721,032 B2	5/2010	Bushell et al.
7,293,060 B2	11/2007	Komsu	7,742,740 B2	6/2010	Goldberg et al.
7,295,548 B2	11/2007	Blank et al.	7,742,832 B1	6/2010	Feldman et al.
7,302,468 B2	11/2007	Wijeratne	7,743,009 B2	6/2010	Hangartner et al.
7,305,694 B2	12/2007	Commons et al.	7,746,906 B2	6/2010	Jinzaki et al.
7,308,188 B2	12/2007	Namatame	7,761,176 B2	7/2010	Ben-Yaacov et al.
7,310,334 B1	12/2007	Fitzgerald et al.	7,765,315 B2	7/2010	Batson et al.
7,312,785 B2	12/2007	Tsuk et al.	RE41,608 E	8/2010	Blair et al.
7,313,593 B1	12/2007	Pulito et al.	7,792,311 B1	9/2010	Holmgren et al.
7,319,764 B1	1/2008	Reid et al.	7,793,206 B2	9/2010	Lim et al.
7,324,857 B2	1/2008	Goddard	7,804,972 B2	9/2010	Melanson
7,330,875 B1	2/2008	Parasnis et al.	7,805,210 B2	9/2010	Cucos et al.
			7,817,960 B2	10/2010	Tan et al.
			7,827,259 B2	11/2010	Heller et al.
			7,831,054 B2	11/2010	Ball et al.
			7,835,689 B2	11/2010	Goldberg et al.

US 10,469,966 B2

Page 5

(56)

References Cited

U.S. PATENT DOCUMENTS

7,849,181 B2	12/2010	Slemmer et al.	8,265,310 B2	9/2012	Berardi et al.
7,853,341 B2	12/2010	McCarty et al.	8,279,709 B2	10/2012	Choisel et al.
7,865,137 B2	1/2011	Goldberg et al.	8,281,001 B2	10/2012	Busam et al.
7,882,234 B2	2/2011	Watanabe et al.	8,285,404 B1	10/2012	Kekki
7,885,622 B2	2/2011	Krampf et al.	8,290,185 B2	10/2012	Kim
7,907,819 B2	3/2011	Ando et al.	8,290,603 B1	10/2012	Lambourne et al.
7,916,877 B2	3/2011	Goldberg et al.	8,300,845 B2	10/2012	Zurek et al.
7,917,082 B2	3/2011	Goldberg et al.	8,306,235 B2	11/2012	Mahowald
7,933,418 B2	4/2011	Morishima	8,311,226 B2	11/2012	Lorgeoux et al.
7,934,239 B1	4/2011	Dagman	8,315,555 B2	11/2012	Ko et al.
7,945,636 B2	5/2011	Nelson et al.	8,316,147 B2	11/2012	Batson et al.
7,945,708 B2	5/2011	Ohkita	8,325,931 B2	12/2012	Howard et al.
7,958,441 B2	6/2011	Heller et al.	8,325,935 B2	12/2012	Rutschman
7,962,482 B2	6/2011	Handman et al.	8,331,585 B2	12/2012	Hagen et al.
7,966,388 B1	6/2011	Pugaczewski et al.	8,340,330 B2	12/2012	Yoon et al.
7,987,294 B2	7/2011	Bryce et al.	8,345,709 B2	1/2013	Nitzpon et al.
7,995,732 B2	8/2011	Koch et al.	8,364,295 B2	1/2013	Beckmann et al.
7,996,566 B1	8/2011	Sylvain et al.	8,370,678 B2	2/2013	Millington et al.
7,996,588 B2	8/2011	Subbiah et al.	8,374,595 B2	2/2013	Chien et al.
8,014,423 B2	9/2011	Thaler et al.	8,391,501 B2	3/2013	Khawand et al.
8,015,306 B2	9/2011	Bowman	8,407,623 B2	3/2013	Kerr et al.
8,020,023 B2	9/2011	Millington et al.	8,411,883 B2	4/2013	Matsumoto
8,023,663 B2	9/2011	Goldberg	8,423,659 B2	4/2013	Millington
8,028,038 B2	9/2011	Weel	8,423,893 B2	4/2013	Ramsay et al.
8,028,323 B2	9/2011	Weel	8,432,851 B2	4/2013	Xu et al.
8,041,062 B2	10/2011	Cohen et al.	8,433,076 B2	4/2013	Zurek et al.
8,045,721 B2	10/2011	Burgan et al.	8,442,239 B2	5/2013	Bruelle-Drews et al.
8,045,952 B2	10/2011	Qureshey et al.	8,452,020 B2	5/2013	Gregg et al.
8,050,203 B2	11/2011	Jacobsen et al.	8,457,334 B2	6/2013	Yoon et al.
8,050,652 B2	11/2011	Qureshey et al.	8,463,184 B2	6/2013	Dua
8,054,987 B2	11/2011	Seydoux	8,463,875 B2	6/2013	Katz et al.
8,055,364 B2	11/2011	Champion	8,473,844 B2	6/2013	Kreifeldt et al.
8,063,698 B2	11/2011	Howard	8,477,958 B2	7/2013	Moeller et al.
8,074,253 B1	12/2011	Nathan	8,483,853 B1	7/2013	Lambourne et al.
8,086,287 B2	12/2011	Mooney et al.	8,498,726 B2	7/2013	Kim et al.
8,086,752 B2	12/2011	Millington et al.	8,509,211 B2	8/2013	Trotter et al.
8,090,317 B2	1/2012	Burge et al.	8,520,870 B2	8/2013	Sato et al.
8,103,009 B2	1/2012	McCarty et al.	8,565,455 B2	10/2013	Worrell et al.
8,111,132 B2	2/2012	Allen et al.	8,577,045 B2	11/2013	Gibbs
8,112,032 B2	2/2012	Ko et al.	8,577,048 B2	11/2013	Chaikin et al.
8,116,476 B2	2/2012	Inohara	8,588,432 B1	11/2013	Simon
8,126,172 B2	2/2012	Horbach et al.	8,588,949 B2	11/2013	Lambourne et al.
8,131,389 B1	3/2012	Hardwick et al.	8,600,075 B2	12/2013	Lim
8,131,390 B2	3/2012	Braithwaite et al.	8,600,084 B1	12/2013	Garrett
8,135,141 B2	3/2012	Shiba	8,611,559 B2	12/2013	Sanders
8,139,774 B2	3/2012	Berardi et al.	8,615,091 B2	12/2013	Terwal
8,144,883 B2	3/2012	Pdersen et al.	8,620,006 B2	12/2013	Berardi et al.
8,148,622 B2	4/2012	Rothkopf et al.	8,639,830 B2	1/2014	Bowman
8,150,079 B2	4/2012	Maeda et al.	8,654,995 B2	2/2014	Silber et al.
8,160,281 B2	4/2012	Kim et al.	8,672,744 B1	3/2014	Gronkowski et al.
8,169,938 B2	5/2012	Duchscher et al.	8,683,009 B2	3/2014	Ng et al.
8,170,222 B2	5/2012	Dunko	8,700,730 B2	4/2014	Rowe
8,170,260 B2	5/2012	Reining et al.	8,731,206 B1	5/2014	Park
8,175,292 B2	5/2012	Aylward et al.	8,750,282 B2	6/2014	Gelter et al.
8,175,297 B1	5/2012	Ho et al.	8,751,026 B2	6/2014	Sato et al.
8,185,674 B2	5/2012	Moore et al.	8,762,565 B2	6/2014	Togashi et al.
8,189,824 B2	5/2012	Strauss et al.	8,775,546 B2	7/2014	Millington
8,194,874 B2	6/2012	Starobin et al.	8,788,080 B1	7/2014	Kallai et al.
8,204,890 B1	6/2012	Gogan et al.	8,818,538 B2	8/2014	Sakata
8,208,653 B2	6/2012	Eo et al.	8,819,554 B2	8/2014	Basso et al.
8,214,447 B2	7/2012	Deslippe et al.	8,843,224 B2	9/2014	Holmgren et al.
8,214,740 B2	7/2012	Johnson	8,843,228 B2	9/2014	Lambourne
8,214,873 B2	7/2012	Weel	8,843,586 B2	9/2014	Pantos et al.
8,218,790 B2	7/2012	Bull et al.	8,855,319 B2	10/2014	Liu et al.
8,229,125 B2	7/2012	Short	8,861,739 B2	10/2014	Ojanpera
8,230,099 B2	7/2012	Weel	8,879,761 B2	11/2014	Johnson et al.
8,233,029 B2	7/2012	Yoshida et al.	8,885,851 B2	11/2014	Westenbroek
8,233,632 B1	7/2012	MacDonald et al.	8,886,347 B2	11/2014	Lambourne
8,233,635 B2	7/2012	Shiba	8,904,066 B2	12/2014	Moore et al.
8,233,648 B2	7/2012	Sorek et al.	8,914,559 B2	12/2014	Kalayjian et al.
8,234,395 B2	7/2012	Millington et al.	8,917,877 B2	12/2014	Haaff et al.
8,238,578 B2	8/2012	Aylward	8,923,997 B2	12/2014	Kallai et al.
8,239,559 B2	8/2012	Rajapakse	8,930,006 B2	1/2015	Haatainen
8,239,748 B1	8/2012	Moore et al.	8,934,647 B2	1/2015	Joyce et al.
8,243,961 B1	8/2012	Morrill	8,934,655 B2	1/2015	Breen et al.
			8,942,252 B2	1/2015	Balassanian et al.
			8,942,395 B2	1/2015	Lissaman et al.
			8,954,177 B2	2/2015	Sanders
			8,965,544 B2	2/2015	Ramsay

US 10,469,966 B2

Page 6

(56)

References Cited

U.S. PATENT DOCUMENTS

8,965,546 B2	2/2015	Visser et al.	2003/0002689 A1	1/2003	Folio
8,966,394 B2	2/2015	Gates et al.	2003/0008616 A1	1/2003	Anderson
8,977,974 B2	3/2015	Kraut	2003/0014486 A1	1/2003	May
8,984,442 B2	3/2015	Pirnack et al.	2003/0018797 A1	1/2003	Dunning et al.
9,020,153 B2	4/2015	Britt, Jr.	2003/0020763 A1	1/2003	Mayer et al.
9,042,556 B2	5/2015	Kallai et al.	2003/0023741 A1	1/2003	Tomassetti et al.
9,112,622 B2	8/2015	Miyata et al.	2003/0031333 A1	2/2003	Cohen et al.
9,137,602 B2	9/2015	Mayman et al.	2003/0035072 A1	2/2003	Hagg
9,160,965 B2	10/2015	Redmann et al.	2003/0035444 A1	2/2003	Zwack
9,195,258 B2	11/2015	Millington	2003/0041173 A1	2/2003	Hoyle
9,219,959 B2	12/2015	Kallai et al.	2003/0041174 A1	2/2003	Wen et al.
9,226,073 B2	12/2015	Ramos et al.	2003/0043856 A1	3/2003	Lakaniemi et al.
9,245,514 B2	1/2016	Donaldson	2003/0043924 A1	3/2003	Haddad et al.
9,325,286 B1	4/2016	Yang	2003/0055892 A1	3/2003	Huitema et al.
9,524,098 B2	12/2016	Griffiths et al.	2003/0061428 A1	3/2003	Garney et al.
2001/0001160 A1	5/2001	Shoff et al.	2003/0063755 A1	4/2003	Nourse et al.
2001/0009604 A1	7/2001	Ando et al.	2003/0066094 A1	4/2003	Van Der Schaar et al.
2001/0022823 A1	9/2001	Renaud	2003/0067437 A1	4/2003	McClintock et al.
2001/0027498 A1	10/2001	Van De Meulenhof et al.	2003/0073432 A1	4/2003	Meade
2001/0032188 A1	10/2001	Miyabe et al.	2003/0091322 A1	5/2003	Van
2001/0042107 A1	11/2001	Palm	2003/0097478 A1	5/2003	King
2001/0043456 A1	11/2001	Atkinson	2003/0099212 A1	5/2003	Anjum et al.
2001/0046235 A1	11/2001	Trevitt et al.	2003/0099221 A1	5/2003	Rhee
2001/0047377 A1	11/2001	Sincaglia et al.	2003/0101253 A1	5/2003	Saito et al.
2001/0050991 A1	12/2001	Eves	2003/0103088 A1	6/2003	Dresti et al.
2002/0002039 A1	1/2002	Qureshey et al.	2003/0110329 A1	6/2003	Higaki et al.
2002/0002562 A1	1/2002	Moran et al.	2003/0126211 A1	7/2003	Anttila et al.
2002/0002565 A1	1/2002	Ohyama	2003/0135822 A1	7/2003	Evans
2002/0003548 A1	1/2002	Krusche et al.	2003/0157951 A1	8/2003	Hasty
2002/0022453 A1	2/2002	Balog et al.	2003/0161479 A1	8/2003	Yang et al.
2002/0026442 A1	2/2002	Lipscomb et al.	2003/0167335 A1	9/2003	Alexander
2002/0034374 A1	3/2002	Barton	2003/0172123 A1	9/2003	Polan et al.
2002/0042844 A1	4/2002	Chiazzese	2003/0177889 A1	9/2003	Koseki et al.
2002/0049843 A1	4/2002	Barone et al.	2003/0179780 A1	9/2003	Walker et al.
2002/0062406 A1	5/2002	Chang et al.	2003/0185400 A1	10/2003	Yoshizawa et al.
2002/0065926 A1	5/2002	Hackney et al.	2003/0195964 A1	10/2003	Mane
2002/0067909 A1	6/2002	Iivonen	2003/0198254 A1	10/2003	Sullivan et al.
2002/0072816 A1	6/2002	Shdema et al.	2003/0198255 A1	10/2003	Sullivan et al.
2002/0072817 A1	6/2002	Champion	2003/0198257 A1	10/2003	Sullivan et al.
2002/0073228 A1	6/2002	Cognet et al.	2003/0200001 A1	10/2003	Goddard et al.
2002/0078161 A1	6/2002	Cheng	2003/0204273 A1	10/2003	Dinker et al.
2002/0078293 A1	6/2002	Kou et al.	2003/0204509 A1	10/2003	Dinker et al.
2002/0080783 A1	6/2002	Fujimori et al.	2003/0210796 A1	11/2003	McCarty et al.
2002/0090914 A1	7/2002	Kang et al.	2003/0212802 A1	11/2003	Rector et al.
2002/0093478 A1	7/2002	Yeh	2003/0219007 A1	11/2003	Barrack et al.
2002/0095460 A1	7/2002	Benson	2003/0227478 A1	12/2003	Chatfield
2002/0098878 A1	7/2002	Mooney et al.	2003/0229900 A1	12/2003	Reisman
2002/0101357 A1	8/2002	Gharapetian	2003/0231208 A1	12/2003	Hanon et al.
2002/0103635 A1	8/2002	Mesarovic	2003/0231871 A1	12/2003	Ushimaru
2002/0109710 A1	8/2002	Holtz et al.	2003/0235304 A1	12/2003	Evans et al.
2002/0112244 A1	8/2002	Liou et al.	2004/0001106 A1	1/2004	Deutscher et al.
2002/0114354 A1	8/2002	Sinha et al.	2004/0001484 A1	1/2004	Ozguner
2002/0114359 A1	8/2002	Ibaraki et al.	2004/0001591 A1	1/2004	Mani et al.
2002/0124097 A1	9/2002	Isely et al.	2004/0008852 A1	1/2004	Also et al.
2002/0129156 A1	9/2002	Yoshikawa	2004/0010727 A1	1/2004	Fujinami
2002/0131398 A1	9/2002	Taylor	2004/0012620 A1	1/2004	Buhler et al.
2002/0131761 A1	9/2002	Kawasaki et al.	2004/0014426 A1	1/2004	Moore
2002/0136335 A1	9/2002	Liou et al.	2004/0015252 A1	1/2004	Aiso et al.
2002/0137505 A1	9/2002	Eiche et al.	2004/0019497 A1	1/2004	Volk et al.
2002/0143547 A1	10/2002	Fay et al.	2004/0019807 A1	1/2004	Freund et al.
2002/0143998 A1	10/2002	Rajagopal et al.	2004/0019911 A1	1/2004	Gates et al.
2002/0150053 A1	10/2002	Gray et al.	2004/0023697 A1	2/2004	Komura
2002/0159596 A1	10/2002	Durand et al.	2004/0024478 A1	2/2004	Hans et al.
2002/0163361 A1	11/2002	Parkin	2004/0024925 A1	2/2004	Cypher et al.
2002/0165721 A1	11/2002	Chang et al.	2004/0027166 A1	2/2004	Mangum et al.
2002/0165921 A1	11/2002	Sapieyevski	2004/0032348 A1	2/2004	Lai et al.
2002/0168938 A1	11/2002	Chang	2004/0032421 A1	2/2004	Williamson et al.
2002/0173273 A1	11/2002	Spurgat et al.	2004/0037433 A1	2/2004	Chen
2002/0177411 A1	11/2002	Yajima et al.	2004/0041836 A1	3/2004	Zaner et al.
2002/0181355 A1	12/2002	Shikunami et al.	2004/0042629 A1	3/2004	Mellone et al.
2002/0184310 A1	12/2002	Traversat et al.	2004/0044742 A1	3/2004	Evron et al.
2002/0188762 A1	12/2002	Tomassetti et al.	2004/0048569 A1	3/2004	Kawamura
2002/0194309 A1	12/2002	Carter et al.	2004/0059842 A1	3/2004	Hanson et al.
2002/0196951 A1	12/2002	Tsai	2004/0059965 A1	3/2004	Marshall et al.
2003/0002609 A1	1/2003	Faller et al.	2004/0066736 A1	4/2004	Kroeger
			2004/0071299 A1	4/2004	Yoshino
			2004/0075767 A1	4/2004	Neuman et al.
			2004/0078383 A1	4/2004	Mercer et al.
			2004/0080671 A1	4/2004	Siemens et al.

US 10,469,966 B2

Page 7

(56)

References Cited

U.S. PATENT DOCUMENTS

2004/0093096 A1	5/2004	Huang et al.	2005/0216556 A1	9/2005	Manion et al.
2004/0098754 A1	5/2004	Vella et al.	2005/0254505 A1	11/2005	Chang et al.
2004/0111473 A1	6/2004	Lysenko et al.	2005/0262217 A1	11/2005	Nonaka et al.
2004/0114771 A1	6/2004	Vaughan et al.	2005/0266798 A1	12/2005	Moloney et al.
2004/0117044 A1	6/2004	Konetski	2005/0266826 A1	12/2005	Vlad
2004/0117462 A1	6/2004	Bodin et al.	2005/0281255 A1	12/2005	Davies et al.
2004/0128701 A1	7/2004	Kaneko et al.	2005/0283820 A1	12/2005	Richards et al.
2004/0131192 A1	7/2004	Metcalf	2005/0288805 A1	12/2005	Moore et al.
2004/0133689 A1	7/2004	Vasisht	2005/0289224 A1	12/2005	Deslippe et al.
2004/0143368 A1	7/2004	May et al.	2005/0289244 A1	12/2005	Sahu et al.
2004/0143852 A1	7/2004	Meyers	2006/0041616 A1	2/2006	Ludwig et al.
2004/0147224 A1	7/2004	Lee	2006/0041639 A1	2/2006	Lamkin et al.
2004/0148237 A1	7/2004	Bittmann et al.	2006/0045281 A1	3/2006	Korneluk et al.
2004/0168081 A1	8/2004	Ladas et al.	2006/0072489 A1	4/2006	Toyoshima
2004/0170383 A1	9/2004	Mazur	2006/0095516 A1	5/2006	Wijeratne
2004/0171346 A1	9/2004	Lin	2006/0098936 A1	5/2006	Ikeda et al.
2004/0177167 A1	9/2004	Iwamura et al.	2006/0119497 A1	6/2006	Miller et al.
2004/0179554 A1	9/2004	Tsao	2006/0143236 A1	6/2006	Wu
2004/0183827 A1	9/2004	Putterman et al.	2006/0149402 A1	7/2006	Chung
2004/0185773 A1	9/2004	Gerber et al.	2006/0155721 A1	7/2006	Grunwald et al.
2004/0203354 A1	10/2004	Yue	2006/0173844 A1	8/2006	Zhang et al.
2004/0203378 A1	10/2004	Powers	2006/0179160 A1	8/2006	Uehara et al.
2004/0203590 A1	10/2004	Shteyn	2006/0193454 A1	8/2006	Abou-Chakra et al.
2004/0208158 A1	10/2004	Fellman et al.	2006/0193482 A1	8/2006	Harvey et al.
2004/0213230 A1	10/2004	Douskalis et al.	2006/0199538 A1	9/2006	Eisenbach
2004/0220687 A1	11/2004	Klotz et al.	2006/0205349 A1	9/2006	Passier et al.
2004/0223622 A1	11/2004	Lindemann et al.	2006/0222186 A1	10/2006	Paige et al.
2004/0224638 A1	11/2004	Fadell et al.	2006/0227985 A1	10/2006	Kawanami
2004/0225389 A1	11/2004	Ledoux et al.	2006/0229752 A1	10/2006	Chung
2004/0228367 A1	11/2004	Mosig et al.	2006/0259649 A1	11/2006	Hsieh et al.
2004/0248601 A1	12/2004	Chang	2006/0270395 A1	11/2006	Dhawan et al.
2004/0249490 A1	12/2004	Sakai	2006/0294569 A1	12/2006	Chung
2004/0249965 A1	12/2004	Huggins et al.	2007/0003067 A1	1/2007	Gierl et al.
2004/0249982 A1	12/2004	Arnold et al.	2007/0003075 A1	1/2007	Cooper et al.
2004/0252400 A1	12/2004	Blank et al.	2007/0022207 A1	1/2007	Millington et al.
2004/0253969 A1	12/2004	Nguyen et al.	2007/0038999 A1	2/2007	Millington et al.
2004/0264717 A1	12/2004	Fujita et al.	2007/0043847 A1	2/2007	Carter et al.
2005/0002535 A1	1/2005	Liu et al.	2007/0047712 A1	3/2007	Gross et al.
2005/0010691 A1	1/2005	Oyadomari et al.	2007/0048713 A1	3/2007	Plastina et al.
2005/0011388 A1	1/2005	Kouznetsov	2007/0054680 A1	3/2007	Mo et al.
2005/0013394 A1	1/2005	Rausch et al.	2007/0071255 A1	3/2007	Schobben
2005/0015551 A1	1/2005	Eames et al.	2007/0087686 A1	4/2007	Holm et al.
2005/0021470 A1	1/2005	Martin et al.	2007/0142022 A1	6/2007	Madonna et al.
2005/0021590 A1	1/2005	Debique et al.	2007/0142944 A1	6/2007	Goldberg et al.
2005/0027821 A1	2/2005	Alexander et al.	2007/0143493 A1	6/2007	Mullig et al.
2005/0031135 A1	2/2005	Devantier et al.	2007/0169115 A1	7/2007	Ko et al.
2005/0047605 A1	3/2005	Lee et al.	2007/0180137 A1	8/2007	Rajapakse
2005/0058149 A1	3/2005	Howe	2007/0189544 A1	8/2007	Rosenberg
2005/0060435 A1	3/2005	Xue et al.	2007/0192156 A1	8/2007	Gauger
2005/0062637 A1	3/2005	El Zabadiani et al.	2007/0206829 A1	9/2007	Weinans et al.
2005/0069153 A1	3/2005	Hall et al.	2007/0223725 A1	9/2007	Neumann et al.
2005/0081213 A1	4/2005	Suzuoki et al.	2007/0249295 A1	10/2007	Ukita et al.
2005/0100174 A1	5/2005	Howard et al.	2007/0265031 A1	11/2007	Koizumi et al.
2005/0105052 A1	5/2005	McCormick et al.	2007/0271388 A1	11/2007	Bowra et al.
2005/0114538 A1	5/2005	Rose	2007/0288610 A1	12/2007	Saint et al.
2005/0120128 A1	6/2005	Willes et al.	2007/0299778 A1	12/2007	Haveson et al.
2005/0125222 A1	6/2005	Brown et al.	2008/0002836 A1	1/2008	Moeller et al.
2005/0125357 A1	6/2005	Saadat et al.	2008/0007649 A1	1/2008	Bennett
2005/0131558 A1	6/2005	Braithwaite et al.	2008/0007650 A1	1/2008	Bennett
2005/0144284 A1	6/2005	Ludwig et al.	2008/0007651 A1	1/2008	Bennett
2005/0147261 A1	7/2005	Yeh	2008/0018785 A1	1/2008	Bennett
2005/0154766 A1	7/2005	Huang et al.	2008/0022320 A1	1/2008	Ver Steeg
2005/0159833 A1	7/2005	Giamo et al.	2008/0025535 A1	1/2008	Rajapakse
2005/0160270 A1	7/2005	Goldberg et al.	2008/0045140 A1	2/2008	Korhonen et al.
2005/0166135 A1	7/2005	Burke et al.	2008/0065232 A1	3/2008	Igoe
2005/0168630 A1	8/2005	Yamada et al.	2008/0066094 A1	3/2008	Igoe
2005/0177256 A1	8/2005	Shintani et al.	2008/0066120 A1	3/2008	Igoe
2005/0177643 A1	8/2005	Xu	2008/0072816 A1	3/2008	Riess et al.
2005/0181348 A1	8/2005	Carey et al.	2008/0075295 A1	3/2008	Mayman et al.
2005/0195205 A1	9/2005	Abrams, Jr.	2008/0077261 A1	3/2008	Baudino et al.
2005/0195823 A1	9/2005	Chen et al.	2008/0077619 A1	3/2008	Gilley et al.
2005/0195999 A1	9/2005	Takemura et al.	2008/0077620 A1	3/2008	Gilley et al.
2005/0197725 A1	9/2005	Alexander et al.	2008/0086318 A1	4/2008	Gilley et al.
2005/0198574 A1	9/2005	Lamkin et al.	2008/0091771 A1	4/2008	Allen et al.
2005/0201549 A1	9/2005	Dedieu et al.	2008/0092204 A1	4/2008	Bryce et al.
			2008/0120429 A1	5/2008	Millington et al.
			2008/0126943 A1	5/2008	Parasnis et al.
			2008/0144861 A1	6/2008	Melanson et al.
			2008/0144864 A1	6/2008	Huon et al.

US 10,469,966 B2

Page 8

(56)

References Cited

U.S. PATENT DOCUMENTS

2008/0146289 A1	6/2008	Korneluk et al.	2013/0041954 A1	2/2013	Kim et al.
2008/0152165 A1	6/2008	Zacchi	2013/0047084 A1	2/2013	Sanders et al.
2008/0159545 A1	7/2008	Takumai et al.	2013/0051572 A1	2/2013	Goh et al.
2008/0162668 A1	7/2008	Miller	2013/0052940 A1	2/2013	Brillhart et al.
2008/0189272 A1	8/2008	Powers et al.	2013/0070093 A1	3/2013	Rivera et al.
2008/0205070 A1	8/2008	Osada	2013/0080599 A1	3/2013	Ko et al.
2008/0212786 A1	9/2008	Park	2013/0094670 A1	4/2013	Millington
2008/0215169 A1	9/2008	Debettencourt et al.	2013/0124664 A1	5/2013	Fonseca, Jr. et al.
2008/0242222 A1	10/2008	Bryce et al.	2013/0129122 A1	5/2013	Johnson et al.
2008/0247554 A1	10/2008	Caffrey	2013/0132837 A1	5/2013	Mead et al.
2008/0263010 A1	10/2008	Roychoudhuri et al.	2013/0159126 A1	6/2013	Elkady
2008/0291863 A1	11/2008	Agren	2013/0167029 A1	6/2013	Friesen et al.
2008/0303947 A1	12/2008	Ohnishi et al.	2013/0174100 A1	7/2013	Seymour et al.
2009/0011798 A1	1/2009	Yamada	2013/0174223 A1	7/2013	Dykeman et al.
2009/0017868 A1	1/2009	Ueda et al.	2013/0179163 A1	7/2013	Herbig et al.
2009/0031336 A1	1/2009	Chavez et al.	2013/0191454 A1	7/2013	Oliver et al.
2009/0060219 A1	3/2009	Inohara	2013/0197682 A1	8/2013	Millington
2009/0070434 A1	3/2009	Himmelstein	2013/0208911 A1	8/2013	Millington
2009/0089327 A1	4/2009	Kalaboukis et al.	2013/0208921 A1	8/2013	Millington
2009/0097672 A1	4/2009	Buil et al.	2013/0226323 A1	8/2013	Millington
2009/0100189 A1	4/2009	Bahren et al.	2013/0230175 A1	9/2013	Bech et al.
2009/0124289 A1	5/2009	Nishida	2013/0232416 A1	9/2013	Millington
2009/0157905 A1	6/2009	Davis	2013/0236029 A1	9/2013	Millington
2009/0164655 A1	6/2009	Pettersson et al.	2013/0243199 A1	9/2013	Kallai et al.
2009/0169030 A1	7/2009	Inohara	2013/0253679 A1	9/2013	Lambourne
2009/0180632 A1	7/2009	Goldberg et al.	2013/0253934 A1	9/2013	Parekh et al.
2009/0193345 A1	7/2009	Wensley et al.	2013/0259254 A1	10/2013	Xiang et al.
2009/0222115 A1	9/2009	Malcolm et al.	2013/0279706 A1	10/2013	Marti et al.
2009/0228919 A1	9/2009	Zott et al.	2013/0287186 A1	10/2013	Quady
2009/0232326 A1	9/2009	Gordon et al.	2013/0290504 A1	10/2013	Quady
2009/0251604 A1	10/2009	Iyer	2013/0293345 A1	11/2013	Lambourne
2010/0004983 A1	1/2010	Dickerson et al.	2014/0006483 A1	1/2014	Garmark et al.
2010/0010651 A1	1/2010	Kirkeby et al.	2014/0016784 A1	1/2014	Sen et al.
2010/0031366 A1	2/2010	Knight et al.	2014/0016786 A1	1/2014	Sen
2010/0049835 A1	2/2010	Ko et al.	2014/0016802 A1	1/2014	Sen
2010/0052843 A1	3/2010	Cannistraro	2014/0023196 A1	1/2014	Xiang et al.
2010/0067716 A1	3/2010	Katayama	2014/0037097 A1	2/2014	Labosco
2010/0087089 A1	4/2010	Struthers et al.	2014/0064501 A1	3/2014	Olsen et al.
2010/0142735 A1	6/2010	Yoon et al.	2014/0075308 A1	3/2014	Sanders et al.
2010/0153097 A1	6/2010	Hotho et al.	2014/0075311 A1	3/2014	Boettcher et al.
2010/0228740 A1	9/2010	Cannistraro et al.	2014/0079242 A1	3/2014	Nguyen et al.
2010/0272270 A1	10/2010	Chaikin et al.	2014/0108929 A1	4/2014	Garmark et al.
2010/0284389 A1	11/2010	Ramsay et al.	2014/0112481 A1	4/2014	Li et al.
2010/0290643 A1	11/2010	Mihelich et al.	2014/0123005 A1	5/2014	Forstall et al.
2010/0299639 A1	11/2010	Ramsay et al.	2014/0140530 A1	5/2014	Gomes-Casseres et al.
2011/0001632 A1	1/2011	Hohorst	2014/0161265 A1	6/2014	Chaikin et al.
2011/0002487 A1	1/2011	Panther et al.	2014/0181569 A1	6/2014	Millington et al.
2011/0044476 A1	2/2011	Burlingame et al.	2014/0219456 A1	8/2014	Morrell et al.
2011/0066943 A1	3/2011	Brillon et al.	2014/0226823 A1	8/2014	Sen et al.
2011/0110533 A1	5/2011	Choi et al.	2014/0242913 A1	8/2014	Pang
2011/0170710 A1	7/2011	Son	2014/0256260 A1	9/2014	Ueda et al.
2011/0228944 A1	9/2011	Croghan et al.	2014/0267148 A1	9/2014	Luna et al.
2011/0299696 A1	12/2011	Holmgren et al.	2014/0270202 A1	9/2014	Ivanov et al.
2011/0316768 A1	12/2011	McRae	2014/0273859 A1	9/2014	Luna et al.
2012/0029671 A1	2/2012	Millington et al.	2014/0279889 A1	9/2014	Luna et al.
2012/0030366 A1	2/2012	Collart et al.	2014/0285313 A1	9/2014	Luna et al.
2012/0047435 A1	2/2012	Holladay et al.	2014/0286496 A1	9/2014	Luna et al.
2012/0051558 A1	3/2012	Kim et al.	2014/0294200 A1	10/2014	Baumgarte et al.
2012/0051567 A1	3/2012	Castor-Perry	2014/0298174 A1	10/2014	Ikonomov
2012/0060046 A1	3/2012	Millington	2014/0323036 A1	10/2014	Daley et al.
2012/0127831 A1	5/2012	Gicklhorn et al.	2014/0344689 A1	11/2014	Scott et al.
2012/0129446 A1	5/2012	Ko et al.	2014/0355768 A1	12/2014	Sen et al.
2012/0148075 A1	6/2012	Goh et al.	2014/0355794 A1	12/2014	Morrell et al.
2012/0185771 A1	7/2012	Rothkopf et al.	2014/0378056 A1	12/2014	Liu et al.
2012/0192071 A1	7/2012	Millington	2015/0019670 A1	1/2015	Redmann
2012/0207290 A1	8/2012	Moyers et al.	2015/0026613 A1	1/2015	Kwon et al.
2012/0237054 A1	9/2012	Eo et al.	2015/0032844 A1	1/2015	Tarr et al.
2012/0263325 A1	10/2012	Freeman et al.	2015/0043736 A1	2/2015	Olsen et al.
2012/0281058 A1	11/2012	Laney et al.	2015/0049248 A1	2/2015	Wang et al.
2012/0290621 A1	11/2012	Heitz, III et al.	2015/0063610 A1	3/2015	Mossner
2013/0010970 A1	1/2013	Hegarty et al.	2015/0074527 A1	3/2015	Sevigny et al.
2013/0018960 A1	1/2013	Knysz et al.	2015/0074528 A1	3/2015	Sakalowsky et al.
2013/0028443 A1	1/2013	Pance et al.	2015/0098576 A1	4/2015	Sundaresan et al.
2013/0031475 A1	1/2013	Maor et al.	2015/0139210 A1	5/2015	Marin et al.
2013/0038726 A1	2/2013	Kim	2015/0146886 A1	5/2015	Baumgarte
			2015/0201274 A1	7/2015	Ellner et al.
			2015/0256954 A1	9/2015	Carlsson et al.
			2015/0281866 A1	10/2015	Williams et al.
			2015/0286360 A1	10/2015	Wachter et al.

US 10,469,966 B2

Page 9

(56)

References Cited

U.S. PATENT DOCUMENTS

2015/0304288 A1 10/2015 Balasaygun et al.
 2015/0365987 A1 12/2015 Weel
 2017/0188152 A1 6/2017 Watson et al.

FOREIGN PATENT DOCUMENTS

CN 101095372 A 12/2007
 CN 101292500 A 10/2008
 CN 101785182 A 7/2010
 EP 0251584 A2 1/1988
 EP 0672985 A1 9/1995
 EP 0772374 A2 5/1997
 EP 1111527 A2 6/2001
 EP 1122931 A2 8/2001
 EP 1133896 B1 8/2002
 EP 1312188 A1 5/2003
 EP 1389853 A1 2/2004
 EP 2713281 4/2004
 EP 1517464 A2 3/2005
 EP 0895427 A3 1/2006
 EP 1416687 B1 8/2006
 EP 1410686 3/2008
 EP 2043381 A2 4/2009
 EP 2161950 A2 3/2010
 EP 1825713 B1 10/2012
 EP 0742674 B1 4/2014
 EP 2591617 B1 6/2014
 EP 2860992 A1 4/2015
 GB 2284327 A 5/1995
 GB 2338374 12/1999
 GB 2379533 A 3/2003
 GB 2486183 6/2012
 JP 63269633 11/1988
 JP 07-210129 8/1995
 JP 2000149391 A 5/2000
 JP 2001034951 2/2001
 JP 2002111817 4/2002
 JP 2002123267 A 4/2002
 JP 2002358241 A 12/2002
 JP 2003037585 2/2003
 JP 2003506765 A 2/2003
 JP 2003101958 4/2003
 JP 2003169089 A 6/2003
 JP 2004193868 A 7/2004
 JP 2005108427 4/2005
 JP 2005136457 5/2005
 JP 2007241652 A 9/2007
 JP 2007288405 A 11/2007
 JP 2009506603 A 2/2009
 JP 2009135750 6/2009
 JP 2009218888 9/2009
 JP 2009535708 10/2009
 JP 2009538006 A 10/2009
 JP 2011010183 A 1/2011
 JP 2011130496 6/2011
 JP 2011176581 9/2011
 TW 439027 6/2001
 WO 199525313 9/1995
 WO 1999023560 5/1999
 WO 199961985 12/1999
 WO 0019693 A1 4/2000
 WO 2000019693 A1 4/2000
 WO 0110125 A1 2/2001
 WO 200153994 7/2001
 WO 02073851 9/2002
 WO 03093950 A2 11/2003
 WO 2003093950 A2 11/2003
 WO 2005013047 A2 2/2005
 WO 2007023120 A1 3/2007
 WO 2007127485 11/2007
 WO 2007131555 11/2007
 WO 2007135581 A2 11/2007
 WO 2008082350 A1 7/2008
 WO 2008114389 A1 9/2008
 WO 2012050927 4/2012

WO 2012137190 A1 10/2012
 WO 2013012582 1/2013
 WO 2014004182 1/2014
 WO 2014149533 A2 9/2014
 WO 2015024881 A1 2/2015

OTHER PUBLICATIONS

Non-Final Office Action dated Nov. 19, 2014, issued in connection with U.S. Appl. No. 13/848,921, filed Mar. 22, 2013, 9 pages.
 Non-Final Office Action dated Aug. 20, 2009, issued in connection with U.S. Appl. No. 11/906,702, filed Oct. 2, 2007, 27 pages.
 Non-Final Office Action dated Oct. 20, 2016, issued in connection with U.S. Appl. No. 14/563,515, filed Dec. 8, 2014, 10 pages.
 Non-Final Office Action dated Sep. 21, 2016, issued in connection with U.S. Appl. No. 15/080,591, filed Mar. 25, 2016, 9 pages.
 Non-Final Office Action dated Sep. 21, 2016, issued in connection with U.S. Appl. No. 15/080,716, filed Mar. 25, 2016, 8 pages.
 Non-Final Office Action dated Sep. 21, 2016, issued in connection with U.S. Appl. No. 15/088,283, filed Apr. 1, 2016, 9 pages.
 Non-Final Office Action dated Sep. 21, 2016, issued in connection with U.S. Appl. No. 15/088,532, filed Apr. 1, 2016, 9 pages.
 Non-Final Office Action dated Aug. 22, 2018, issued in connection with U.S. Appl. No. 15/487,686, filed Apr. 14, 2017, 13 pages.
 Non-Final Office Action dated Dec. 22, 2014, issued in connection with U.S. Appl. No. 13/458,558, filed Apr. 27, 2012, 11 pages.
 Non-Final Office Action dated Sep. 22, 2016, issued in connection with U.S. Appl. No. 15/088,906, filed Apr. 1, 2016, 9 pages.
 Non-Final Office Action dated Sep. 22, 2016, issued in connection with U.S. Appl. No. 15/155,149, filed May 16, 2016, 7 pages.
 Non-Final Office Action dated Jun. 23, 2015, issued in connection with U.S. Appl. No. 13/705,176, filed Dec. 5, 2012, 30 pages.
 Non-Final Office Action dated Mar. 23, 2015, issued in connection with U.S. Appl. No. 14/299,847, filed Jun. 9, 2014, 14 pages.
 Non-Final Office Action dated Oct. 23, 2014, issued in connection with U.S. Appl. No. 13/848,904, filed Mar. 22, 2013, 11 pages.
 Non-Final Office Action dated Oct. 23, 2014, issued in connection with U.S. Appl. No. 13/864,251, filed Apr. 17, 2013, 11 pages.
 Non-Final Office Action dated Oct. 23, 2014, issued in connection with U.S. Appl. No. 13/888,203, filed May 6, 2013, 9 pages.
 Non-Final Office Action dated Sep. 23, 2014, issued in connection with U.S. Appl. No. 13/630,565, filed Sep. 28, 2012, 7 pages.
 Non-Final Office Action dated Feb. 24, 2017, issued in connection with U.S. Appl. No. 14/619,813, filed Feb. 11, 2015, 9 pages.
 Non-Final Office Action dated May 24, 2016, issued in connection with U.S. Appl. No. 15/134,767, filed Apr. 21, 2016, 12 pages.
 Non-Final Office Action dated Oct. 24, 2014, issued in connection with U.S. Appl. No. 13/435,776, filed Mar. 30, 2012, 14 pages.
 Non-Final Office Action dated Apr. 25, 2018, issued in connection with U.S. Appl. No. 15/130,919, filed Apr. 15, 2016, 13 pages.
 Non-Final Office Action dated Feb. 26, 2015, issued in connection with U.S. Appl. No. 14/186,850, filed Feb. 21, 2014, 25 pages.
 Non-Final Office Action dated Mar. 26, 2015, issued in connection with U.S. Appl. No. 14/184,528, filed Feb. 19, 2014, 18 pages.
 Non-Final Office Action dated Jan. 27, 2015, issued in connection with U.S. Appl. No. 14/465,457, filed Aug. 21, 2014, 11 pages.
 Non-Final Office Action dated Jun. 27, 2008, issued in connection with U.S. Appl. No. 10/861,653, filed Jun. 5, 2004, 19 pages.
 Non-Final Office Action dated Mar. 27, 2015, issued in connection with U.S. Appl. No. 13/705,178, filed Dec. 5, 2012, 14 pages.
 Non-Final Office Action dated Sep. 27, 2013, issued in connection with U.S. Appl. No. 13/013,740, filed Jan. 25, 2011, 12 pages.
 Non-Final Office Action dated Sep. 27, 2016, issued in connection with U.S. Appl. No. 15/228,685, filed Aug. 4, 2016, 8 pages.
 Non-Final Office Action dated Dec. 28, 2015, issued in connection with U.S. Appl. No. 14/290,493, filed May 29, 2014, 29 pages.
 Non-Final Office Action dated Dec. 28, 2016, issued in connection with U.S. Appl. No. 15/343,000, filed Nov. 3, 2016, 11 pages.
 Non-Final Office Action dated Jan. 29, 2016, issued in connection with U.S. Appl. No. 14/937,523, filed Nov. 10, 2015, 10 pages.
 Non-Final Office Action dated Jun. 29, 2016, issued in connection with U.S. Appl. No. 14/629,937, filed Feb. 24, 2015, 12 pages.

US 10,469,966 B2

Page 10

(56)

References Cited

OTHER PUBLICATIONS

Non-Final Office Action dated Apr. 30, 2012, issued in connection with U.S. Appl. No. 13/204,511, filed Aug. 5, 2011, 16 pages.

Non-Final Office Action dated Jan. 30, 2015, issued in connection with U.S. Appl. No. 14/290,493, filed May 29, 2014, 29 pages.

Non-Final Office Action dated Jan. 30, 2015, issued in connection with U.S. Appl. No. 14/504,812, filed Oct. 2, 2014, 13 pages.

Non-Final Office Action dated Nov. 30, 2016, issued in connection with U.S. Appl. No. 15/243,186, filed Aug. 22, 2016, 12 pages.

Non-Final Office Action dated Oct. 30, 2018, issued in connection with U.S. Appl. No. 16/128,443, filed Sep. 11, 2018, 21 pages.

Non-Final Office Action dated Sep. 30, 2016, issued in connection with U.S. Appl. No. 13/864,249, filed Apr. 17, 2013, 12 pages.

Non-Final Office Action dated Oct. 31, 2016, issued in connection with U.S. Appl. No. 14/806,070, filed Jul. 22, 2015, 11 pages.

North American MPEG-2 Information, "The MPEG-2 Transport Stream," Retrieved from the Internet: URL: <http://www.coolstf.mpeg/#ts>, 2006, pp. 1-5.

Notice of Allowability dated Apr. 18, 2013, issued in connection with U.S. Appl. No. 11/853,790, filed Sep. 11, 2007, 4 pages.

Notice of Allowance dated Jan. 31, 2013, issued in connection with U.S. Appl. No. 13/298,090, filed Nov. 16, 2011, 19 pages.

Notice of Allowance dated Dec. 1, 2016, issued in connection with U.S. Appl. No. 15/088,283, filed Apr. 1, 2016, 9 pages.

Notice of Allowance dated Jun. 1, 2017, issued in connection with U.S. Appl. No. 14/808,397, filed Jul. 24, 2015, 5 pages.

Notice of Allowance dated Dec. 2, 2016, issued in connection with U.S. Appl. No. 15/088,532, filed Apr. 1, 2016, 9 pages.

Notice of Allowance dated Dec. 2, 2016, issued in connection with U.S. Appl. No. 15/088,678, filed Apr. 1, 2016, 9 pages.

Notice of Allowance dated Dec. 2, 2016, issued in connection with U.S. Appl. No. 15/089,758, filed Apr. 4, 2016, 9 pages.

Notice of Allowance dated Dec. 2, 2016, issued in connection with U.S. Appl. No. 15/155,149, filed May 16, 2016, 9 pages.

Notice of Allowance dated Jul. 2, 2015, issued in connection with U.S. Appl. No. 13/848,904, filed Mar. 22, 2013, 17 pages.

Notice of Allowance dated Jul. 2, 2015, issued in connection with U.S. Appl. No. 13/888,203, filed May 6, 2013, 19 pages.

"ZR-8630AV MultiZone Audio/Video Receiver, Installation and Operation Guide," Niles Audio Corporation, 2003, 86 pages.

ZX135: Installation Manual, LA Audio, Apr. 2003, 44 pages.

Sonos, Inc. v. D&M Holdings, Inc., Defendants' Final Invalidation Contentions (Jan. 18, 2017) (106 pages).

Sonos, Inc. v. D&M Holdings, DI 226, Opinion Denying Inequitable Conduct Defenses, Feb. 6, 2017, updated, 5 pages.

Sonos, Inc. v. D&M Holdings, DI 242, US District Judge Andrews 101 Opinion, Mar. 2017, 16 pages.

Sonos, Inc. v. D&M Holdings, Sonos Supp Opening Markman Brief including Exhibits, Mar. 3, 2017, 17 pages.

Sonos, Inc. v. D&M Holdings, Sonos Supp Reply Markman Brief including Exhibits, Mar. 29, 2017, 36 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Declaration of Steven C. Visser, executed Sep. 9, 2016, 40 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Amended Invalidation Contentions Exhibit 1: Defendants' Invalidation Contentions for U.S. Pat. No. 7,571,014 filed Sep. 16, 2016, 270 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Amended Invalidation Contentions Exhibit 10: Defendants' Invalidation Contentions for U.S. Pat. No. 9,219,959 filed Sep. 27, 2016, 236 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Amended Invalidation Contentions Exhibit 11: Defendants' Invalidation Contentions for Design U.S. Pat. No. D. 559,197 filed Sep. 27, 2016, 52 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Amended Invalidation Contentions Exhibit 2: Defendants' Invalidation Contentions for U.S. Pat. No. 8,588,949 filed Sep. 27, 2016, 224 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Amended Invalidation Contentions Exhibit 3: Defendants' Invalidation Contentions for U.S. Pat. No. 8,843,224 filed Sep. 27, 2016, 147 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Amended Invalidation Contentions Exhibit 4: Defendants' Invalidation Contentions for U.S. Pat. No. 8,938,312 filed Sep. 27, 2016, 229 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Amended Invalidation Contentions Exhibit 5: Defendants' Invalidation Contentions for U.S. Pat. No. 8,938,637 filed Sep. 27, 2016, 213 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Amended Invalidation Contentions Exhibit 6: Defendants' Invalidation Contentions for U.S. Pat. No. 9,042,556 filed Sep. 27, 2016, 162 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Amended Invalidation Contentions Exhibit 7: Defendants' Invalidation Contentions for U.S. Pat. No. 9,195,258 filed Sep. 27, 2016, 418 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Amended Invalidation Contentions Exhibit 8: Defendants' Invalidation Contentions for U.S. Pat. No. 9,202,509 filed Sep. 27, 2016, 331 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Amended Invalidation Contentions Exhibit 9: Defendants' Invalidation Contentions for U.S. Pat. No. 9,213,357 filed Sep. 27, 2016, 251 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Initial Invalidation Contentions Exhibit 1: Defendants' Invalidation Contentions for U.S. Pat. No. 7,571,014 filed Apr. 15, 2016, 161 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Initial Invalidation Contentions Exhibit 10: Defendants' Invalidation Contentions for U.S. Pat. No. 9,213,357 filed Apr. 15, 2016, 244 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Initial Invalidation Contentions Exhibit 11: Defendants' Invalidation Contentions for U.S. Pat. No. 9,219,959 filed Apr. 15, 2016, 172 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Initial Invalidation Contentions Exhibit 12: Defendants' Invalidation Contentions for Design U.S. Pat. No. D. 559,197 filed Apr. 15, 2016, 36 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Initial Invalidation Contentions Exhibit 2: Defendants' Invalidation Contentions for U.S. Pat. No. 8,588,949 filed Apr. 15, 2016, 112 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Initial Invalidation Contentions Exhibit 3: Defendants' Invalidation Contentions for U.S. Pat. No. 8,843,224 filed Apr. 15, 2016, 118 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Initial Invalidation Contentions Exhibit 4: Defendants' Invalidation Contentions for U.S. Pat. No. 8,938,312 filed Apr. 15, 2016, 217 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Initial Invalidation Contentions Exhibit 5: Defendants' Invalidation Contentions for U.S. Pat. No. 8,938,637 filed Apr. 15, 2016, 177 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Initial Invalidation Contentions Exhibit 6: Defendants' Invalidation Contentions for U.S. Pat. No. 9,042,556 filed Apr. 15, 2016, 86 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Initial Invalidation Contentions Exhibit 7: Defendants' Invalidation Contentions for U.S. Pat. No. 9,130,771 filed Apr. 15, 2016, 203 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Initial Invalidation Contentions Exhibit 8: Defendants' Invalidation Contentions for U.S. Pat. No. 9,195,258 filed Apr. 15, 2016, 400 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Initial Invalidation Contentions Exhibit 9: Defendants' Invalidation Contentions for U.S. Pat. No. 9,202,509 filed Apr. 15, 2016, 163 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Preliminary Identification of Prior Art References, provided Jul. 29, 2016, 5 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendants' Brief in Support of their Motion for Leave to Amend their Answer to Add the Defense of Inequitable Conduct, provided Oct. 12, 2016, 24 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendants' Opposition to Sonos's Motion to Strike Defendants' New Amended Answer Submitted with their Reply, provided Oct. 3, 2016, 15 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Exhibit A: Defendants' Second Amended Answer to Plaintiffs' Third Amended complaint, provided Oct. 12, 2016, 43 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Exhibit B: Defendants' Second Amended Answer to Plaintiffs' Third Amended Complaint, provided Oct. 12, 2016, 43 pages.

US 10,469,966 B2

Page 11

(56)

References Cited

OTHER PUBLICATIONS

Sonos, Inc. v. D&M Holdings Inc. et al., Opening Brief in Support of Defendants' Motion for Leave to Amend Their Answer to Add the Defense of Inequitable Conduct, provided Aug. 1, 2016, 11 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Order, provided Oct. 7, 2016, 2 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Plaintiff's Opposition to Defendants' Motion for Leave to Amend Their Answer to Add the Defense of Inequitable Conduct, provided Aug. 26, 2016, 25 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Redlined Exhibit B: Defendants' First Amended Answer to Plaintiffs' Third Amended Complaint, provided Aug. 1, 2016, 27 pages.

Sonos, Inc. v. D&M Holdings, DI 206-1, Transcript of 101 Hearing (Nov. 28, 2016) (28 pages).

Sonos, Inc. v. D&M Holdings, DI 207, Public Joint Claim Construction Brief (Nov. 30, 2016) (88 pages).

Sonos, Inc. v. D&M Holdings, DI 214, D&M Post-Markman Letter (Dec. 22, 2016) (13 pages).

Sonos, Inc. v. D&M Holdings, DI 215, Sonos Post-Markman Letter (Dec. 22, 2016) (15 pages).

Sonos, Inc. v. D&M Holdings, DI 219, Claim Construction Opinion (Jan. 12, 2017) (24 pages).

Sonos, Inc. v. D&M Holdings, DI 221, Claim Construction Order (Jan. 18, 2017) (2 pages).

Sonos, Inc. v. D&M Holdings, Markman Hearing Transcript (Dec. 14, 2016) (69 pages).

Sonos Multi-Room Music System User Guide, Version: 091001, 2009, 299 pages.

Sonos Play:3 Product Guide; copyright 2004-2011; 2 pages.

Sonos Play:3 Product Guide; copyright 2004-2012; 14 pages.

Sonos Play:3 Product Guide; copyright 2004-2013; 15 pages.

Sonos Play:3 Teardown; <https://www.ifixit.com/Teardown/Sonos+Play%3A3+Teardown/12475>; 11 pages.

Non-Final Office Action dated May 27, 2014, issued in connection with U.S. Appl. No. 14/186,850, filed Feb. 21, 2014, 13 pages.

Non-Final Office Action dated Feb. 29, 2012, issued in connection with U.S. Appl. No. 13/297,000, filed Nov. 15, 2011, 10 pages.

Non-Final Office Action dated Nov. 29, 2010, issued in connection with U.S. Appl. No. 11/801,468, filed May 9, 2007, 17 pages.

Non-Final Office Action dated Jul. 30, 2013 issued in connection with U.S. Appl. No. 13/724,048, filed Dec. 21, 2012, 7 pages.

Non-Final Office Action dated Jul. 31, 2014, issued in connection with U.S. Appl. No. 13/533,105, filed Jun. 26, 2012, 31 pages.

Non-Final Office Action dated Dec. 1, 2014, issued in connection with U.S. Appl. No. 14/516,867, filed Oct. 17, 2014, 11 pages.

Non-Final Office Action dated Jun. 1, 2016, issued in connection with U.S. Appl. No. 14/184,522, filed Feb. 19, 2014, 21 pages.

Non-Final Office Action dated Jan. 3, 2017, issued in connection with U.S. Appl. No. 14/808,397, filed Jul. 24, 2015, 11 pages.

Non-Final Office Action dated Jun. 3, 2015, issued in connection with U.S. Appl. No. 14/564,544, filed Dec. 9, 2014, 7 pages.

Non-Final Office Action dated Nov. 3, 2016, issued in connection with U.S. Appl. No. 14/184,528, filed Feb. 19, 2014, 17 pages.

Non-Final Office Action dated Jan. 4, 2017, issued in connection with U.S. Appl. No. 14/825,961, filed Aug. 13, 2015, 11 pages.

Non-Final Office Action dated Jun. 4, 2015, issued in connection with U.S. Appl. No. 13/871,795, filed Apr. 26, 2013, 16 pages.

Non-Final Office Action dated Mar. 4, 2015, issued in connection with U.S. Appl. No. 13/435,776, filed Mar. 30, 2012, 16 pages.

Non-Final Office Action dated Oct. 4, 2016, issued in connection with U.S. Appl. No. 15/089,758, filed Apr. 4, 2016, 9 pages.

Non-Final Office Action dated Oct. 5, 2016, issued in connection with U.S. Appl. No. 13/864,250, filed Apr. 17, 2013, 10 pages.

Non-Final Office Action dated Oct. 5, 2016, issued in connection with U.S. Appl. No. 13/864,252, filed Apr. 17, 2013, 11 pages.

Non-Final Office Action dated Oct. 6, 2016, issued in connection with U.S. Appl. No. 15/088,678, filed Apr. 1, 2016, 9 pages.

Non-Final Office Action dated Jul. 7, 2015, issued in connection with U.S. Appl. No. 14/174,244, filed Feb. 6, 2014, 9 pages.

Non-Final Office Action dated Oct. 7, 2016, issued in connection with U.S. Appl. No. 15/156,392, filed May 17, 2016, 8 pages.

Non-Final Office Action dated Mar. 8, 2011, issued in connection with U.S. Appl. No. 11/853,790, filed Sep. 11, 2007, 10 pages.

Non-Final Office Action dated Mar. 8, 2016, issued in connection with U.S. Appl. No. 13/848,921, filed Mar. 22, 2013, 13 pages.

Non-Final Office Action dated Aug. 9, 2016, issued in connection with U.S. Appl. No. 13/871,795, filed Apr. 26, 2013, 31 pages.

Non-Final Office Action dated May 9, 2014, issued in connection with U.S. Appl. No. 13/892,230, filed May 10, 2013, 10 pages.

Non-Final Office Action dated Nov. 1, 2018, issued in connection with U.S. Appl. No. 16/129,758, filed Sep. 12, 2018, 23 pages.

Non-Final Office Action dated Feb. 10, 2016, issued in connection with U.S. Appl. No. 14/937,571, filed Nov. 10, 2015, 9 pages.

Non-Final Office Action dated Mar. 10, 2011, issued in connection with U.S. Appl. No. 12/035,112, filed Feb. 21, 2008, 12 pages.

Non-Final Office Action dated May 10, 2016, issued in connection with U.S. Appl. No. 14/504,812, filed Oct. 2, 2014, 22 pages.

Non-Final Office Action dated Nov. 10, 2016, issued in connection with U.S. Appl. No. 15/243,355, filed Aug. 22, 2016, 11 pages.

Non-Final Office Action dated Jun. 11, 2018, issued in connection with U.S. Appl. No. 15/405,931, filed Jan. 13, 2017, 14 pages.

Non-Final Office Action dated Dec. 12, 2016, issued in connection with U.S. Appl. No. 15/343,019, filed Nov. 3, 2016, 8 pages.

Non-Final Office Action dated Jun. 12, 2015, issued in connection with U.S. Appl. No. 13/848,932, filed Mar. 22, 2013, 16 pages.

Non-Final Office Action dated Mar. 12, 2015, issued in connection with U.S. Appl. No. 13/705,174, filed Dec. 5, 2012, 13 pages.

Non-Final Office Action dated Oct. 12, 2016, issued in connection with U.S. Appl. No. 14/505,966, filed Oct. 3, 2014, 10 pages.

Non-Final Office Action dated Feb. 13, 2014, issued in connection with U.S. Appl. No. 13/896,037, filed May 16, 2013, 10 pages.

Non-Final Office Action dated Feb. 13, 2015, issued in connection with U.S. Appl. No. 13/013,740, filed Jan. 25, 2011, 14 pages.

Non-Final Office Action dated Jan. 13, 2016, issued in connection with U.S. Appl. No. 14/184,528, filed Feb. 19, 2014, 14 pages.

Non-Final Office Action dated Jun. 13, 2016, issued in connection with U.S. Appl. No. 14/620,937, filed Feb. 12, 2015, 12 pages.

Non-Final Office Action dated Jun. 13, 2016, issued in connection with U.S. Appl. No. 15/134,761, filed Apr. 21, 2016, 10 pages.

Non-Final Office Action dated Mar. 13, 2015, issued in connection with U.S. Appl. No. 13/705,177, filed Dec. 5, 2012, 15 pages.

Non-Final Office Action dated May 14, 2018, issued in connection with U.S. Appl. No. 15/228,812, filed Aug. 4, 2016, 15 pages.

Non-Final Office Action dated Dec. 15, 2016, issued in connection with U.S. Appl. No. 13/458,558, filed Apr. 27, 2012, 12 pages.

Non-Final Office Action dated Jul. 15, 2015, issued in connection with U.S. Appl. No. 14/174,253, filed Feb. 6, 2014, 9 pages.

Non-Final Office Action dated Nov. 16, 2016, issued in connection with U.S. Appl. No. 15/228,639, filed Aug. 4, 2016, 15 pages.

Non-Final Office Action dated Dec. 17, 2015, issued in connection with U.S. Appl. No. 13/458,558, filed Apr. 27, 2012, 10 pages.

Non-Final Office Action dated Nov. 17, 2014, issued in connection with U.S. Appl. No. 13/864,247, filed Apr. 17, 2013, 11 pages.

Non-Final Office Action dated Nov. 17, 2016, issued in connection with U.S. Appl. No. 14/620,937, filed Feb. 12, 2015, 14 pages.

Non-Final Office Action dated Feb. 18, 2009, issued in connection with U.S. Appl. No. 10/861,653, filed Jun. 5, 2004, 18 pages.

Non-Final Office Action dated Nov. 18, 2014, issued in connection with U.S. Appl. No. 13/435,739, filed Mar. 30, 2012, 10 pages.

Non-Final Office Action dated Jan. 19, 2018, issued in connection with U.S. Appl. No. 14/629,937, filed Feb. 24, 2015, 14 pages.

Non-Final Office Action dated Jun. 19, 2015, issued in connection with U.S. Appl. No. 13/533,105, filed Jun. 26, 2012, 38 pages.

Notice of Allowance dated Oct. 24, 2016, issued in connection with U.S. Appl. No. 15/134,767, filed Apr. 21, 2016, 7 pages.

Notice of Allowance dated Sep. 24, 2015, issued in connection with U.S. Appl. No. 13/705,174, filed Dec. 5, 2012, 7 pages.

Notice of Allowance dated Sep. 24, 2015, issued in connection with U.S. Appl. No. 14/184,935, filed Feb. 20, 2014, 7 pages.

Notice of Allowance dated Aug. 25, 2017, issued in connection with U.S. Appl. No. 14/505,966, filed Oct. 3, 2014, 5 pages.

US 10,469,966 B2

Page 12

(56)

References Cited

OTHER PUBLICATIONS

- Notice of Allowance dated Sep. 25, 2014, issued in connection with U.S. Appl. No. 14/176,808, filed Feb. 10, 2014, 5 pages.
- Notice of Allowance dated Aug. 27, 2015, issued in connection with U.S. Appl. No. 13/705,177, filed Dec. 5, 2012, 34 pages.
- Notice of Allowance dated Aug. 27, 2015, issued in connection with U.S. Appl. No. 14/505,027, filed Oct. 2, 2014, 18 pages.
- Notice of Allowance dated Dec. 27, 2011, issued in connection with U.S. Appl. No. 10/816,217, filed Apr. 1, 2004, 15 pages.
- Notice of Allowance dated Oct. 27, 2015, issued in connection with U.S. Appl. No. 14/299,847, filed Jun. 9, 2014, 5 pages.
- Notice of Allowance dated Oct. 28, 2014, issued in connection with U.S. Appl. No. 13/896,037, filed May 16, 2013, 7 pages.
- Notice of Allowance dated Jul. 29, 2015, issued in connection with U.S. Appl. No. 13/359,976, filed Jan. 27, 2012, 28 pages.
- Notice of Allowance dated Jul. 29, 2015, issued in connection with U.S. Appl. No. 14/186,850, filed Feb. 21, 2014, 9 pages.
- Notice of Allowance dated Aug. 30, 2016, issued in connection with U.S. Appl. No. 14/290,493, filed May 29, 2014, 7 pages.
- Notice of Allowance dated Jul. 30, 2015, issued in connection with U.S. Appl. No. 13/705,178, filed Dec. 5, 2012, 18 pages.
- Notice of Allowance dated May 30, 2019, issued in connection with U.S. Appl. No. 16/129,758, filed Sep. 12, 2018, 7 pages.
- Notice of Allowance dated Aug. 5, 2015, issued in connection with U.S. Appl. No. 13/435,776, filed Mar. 30, 2012, 26 pages.
- Notice of Allowance dated Jul. 6, 2015, issued in connection with U.S. Appl. No. 13/297,000, filed Nov. 15, 2011, 24 pages.
- Notice of Allowance dated Apr. 7, 2017, issued in connection with U.S. Appl. No. 14/629,937, filed Feb. 24, 2015, 8 pages.
- Notice of Allowance dated Dec. 7, 2018, issued in connection with U.S. Appl. No. 15/228,812, filed Aug. 4, 2016, 7 pages.
- Notice of Incomplete Re-Exam Request dated May 25, 2017, issued in connection with U.S. Appl. No. 90/013,959, filed Apr. 1, 2016, 10 pages.
- Notice of Intent to Issue Re-Examination Certificate dated Mar. 24, 2017, issued in connection with U.S. Appl. No. 90/013,859, filed Nov. 4, 2016, 10 pages.
- Nutzal et al., "Sharing Systems for Future HiFi Systems," IEEE, 2004, 9 pages.
- Office Action in Ex Parte Reexamination dated Oct. 20, 2017, issued in connection with Reexamination U.S. Appl. No. 90/013,959, filed Jun. 16, 2017, 50 pages.
- Palm, Inc., "Handbook for the Palm VII Handheld," May 2000, 311 pages.
- Parasound Zpre2 Zone Preamplifier with PTZI Remote Control, 2005, 16 pages.
- Park et al., "Group Synchronization in MultiCast Media Communications," Proceedings of the 5th Research on Multicast Technology Workshop, 2003, 5 pages.
- Pillai et al., "A Method to Improve the Robustness of MPEG Video Applications over Wireless Networks," Kent Ridge Digital Labs, 2000, 15 pages.
- Polycom Conference Composer User Guide, copyright 2001, 29 pages.
- Postel, J., "User Datagram Protocol," RFC: 768, USC/Information Sciences Institute, Aug. 1980, 3 pages.
- Preinterview First Office Action dated Jun. 8, 2016, issued in connection with U.S. Appl. No. 14/619,813, filed Feb. 11, 2015, 4 pages.
- Pre-Interview First Office Action dated Mar. 10, 2015, issued in connection with U.S. Appl. No. 14/505,027, filed Oct. 2, 2014, 4 pages.
- Presentations at WinHEC 2000, May 2000, 138 pages.
- PRISMIQ, Inc., "PRISMIQ Media Player User Guide," 2003, 44 pages.
- Proficient Audio Systems M6 Quick Start Guide, 2011, 5 pages.
- Proficient Audio Systems: Proficient Editor Advanced Programming Guide, 2007, 40 pages.
- Programming Interface for WL54040 Dual-Band Wireless Transceiver, AVAGO0066, Agere Systems, May 2004, 16 pages.
- Radio Shack, "Auto-Sensing 4-Way Audio/Video Selector Switch," 2004, 1 page.
- RadioShack, Pro-2053 Scanner, 2002 Catalog, part 1, 100 pages.
- RadioShack, Pro-2053 Scanner, 2002 Catalog, part 2, 100 pages.
- RadioShack, Pro-2053 Scanner, 2002 Catalog, part 3, 100 pages.
- RadioShack, Pro-2053 Scanner, 2002 Catalog, part 4, 100 pages.
- RadioShack, Pro-2053 Scanner, 2002 Catalog, part 5, 46 pages.
- Rane: DragNet software; available for sale at least 2006.
- Rangan et al., "Feedback Techniques for Continuity and Synchronization in Multimedia Information Retrieval," ACM Transactions on Information Systems, 1995, pp. 145-176, vol. 13, No. 2.
- Real Time Control Protocol (RTCP) and Realtime Transfer Protocol (RTP), RFC 1889 (Jan. 1996) (D+M_0397810-84) (75 pages).
- Realtime Streaming Protocol (RTSP), RFC 2326 (Apr. 1998) (D+M_0397945-8036) (92 pages).
- Realtime Transport Protocol (RTP), RFC 3550 (Jul. 2003) (D+M_0398235-323) (89 pages).
- Re-Exam Final Office Action dated Aug. 5, 2015, issued in connection with U.S. Appl. No. 90/013,423, filed Jan. 5, 2015, 25 pages.
- Reexam Non-Final Office Action dated Oct. 17, 2016, issued in connection with U.S. Appl. No. 90/013,756, filed May 25, 2016, 31 pages.
- Re-Exam Non-Final Office Action dated Apr. 22, 2015, issued in connection with U.S. Appl. No. 90/013,423, filed Jan. 5, 2015, 16 pages.
- Levergood et al., "AudioFile: A Network-Transparent System for Distributed Audio Applications," Digital Equipment Corporation, 1993, 109 pages.
- LG: RJP-201M Remote Jack Pack Installation and Setup Guide, 2010, 24 pages.
- Lienhart et al., "On the Importance of Exact Synchronization for Distributed Audio Signal Processing," Session L: Poster Session II—ICASSP'03 Papers, 2002, 1 page.
- LinkSys by Cisco, Wireless Home Audio Controller, Wireless-N Touchscreen Remote DMRW1000 Datasheet, Copyright 2008, 2 pages.
- LinkSys by Cisco, Wireless Home Audio Controller, Wireless-N Touchscreen Remote DMRW1000 User Guide, Copyright 2008, 64 pages.
- LinkSys by Cisco, Wireless Home Audio Player, Wireless-N Music Extender DMP100 Quick Installation Guide, Copyright 2009, 32 pages.
- LinkSys by Cisco, Wireless Home Audio Player, Wireless-N Music Extender DMP100 User Guide, Copyright 2008, 65 pages.
- Linux SDK for UPnP Devices v. 1.2 (Sep. 6, 2002) (101 pages).
- Liu et al., "A synchronization control scheme for real-time streaming multimedia applications," Packet Video, 2003, 10 pages, vol. 2003.
- Liu et al., "Adaptive Delay Concealment for Internet Voice Applications with Packet-Based Time-Scale Modification," Information Technologies 2000, pp. 91-102.
- Louderback, Jim, "Affordable Audio Receiver Furnishes Homes With MP3," TechTV Vault. Jun. 28, 2000 retrieved Jul. 10, 2014, 2 pages.
- Machine Translation of JP2004-193868A Wireless Transmission and Reception System and Wireless Transmission and Reception Method, 2 pages.
- Machine Translation of JP2007-2888405A Video Sound Output System, Video Sound Processing Method, and Program, 64 pages.
- Maniactools, "Identify Duplicate Files by Sound," Sep. 28, 2010, <http://www.maniactools.com/soft/music-duplicate-remover/identify-duplicate-files-by-sound.shtml>.
- MediaRenderer:1 Device Template Version 1.01 for UPnP, Version 1.0 (Jun. 25, 2002) (12 pages).
- MediaServer:1 Device Template Version 1.01 for UPnP, Version 1.0 (Jun. 25, 2002) (12 pages).
- Microsoft, Universal Plug and Play (UPnP) Client Support ("Microsoft UPnP") (Aug. 2001) (D+M_0402007-24) (18 pages).
- Microsoft Window's XP Reviewer's Guide (Aug. 2001) (D+M_0402225-85) (61 pages).

US 10,469,966 B2

Page 13

(56)

References Cited

OTHER PUBLICATIONS

"Microsoft Windows XP File and Printer Share with Microsoft Windows" Microsoft Windows XP Technical Article, 2003, 65 pages.

Mills David L., "Network Time Protocol (Version 3) Specification, Implementation and Analysis," Network Working Group, Mar. 1992, 7 pages.

Mills, David L., "Precision Synchronization of Computer Network Clocks," ACM SIGCOMM Computer Communication Review, 1994, pp. 28-43, vol. 24, No. 2.

"Model MRC44 Four Zone—Four Source Audio/Video Controller/Amplifier System," Xantech Corporation, 2002, 52 pages.

Motorola, "Simplefi, Wireless Digital Audio Receiver, Installation and User Guide," Dec. 31, 2001, 111 pages.

"SMPTE Made Simple: A Time Code Tutor by Timeline," 1996, 46 pages.

Network Time Protocol (NTP), RFC 1305 (Mar. 1992) (D+M_0397417-536) (120 pages).

"NexSys Software v.3 Manual," Crest Audio, Inc., 1997, 76 pages.

Niederst, Jennifer "O'Reilly Web Design in a Nutshell," Second Edition, Sep. 2001, 678 pages.

Nilsson, M., "ID3 Tag Version 2," Mar. 26, 1998, 28 pages.

Non-Final Office Action dated May 1, 2014, issued in connection with U.S. Appl. No. 14/184,522, filed Feb. 19, 2014, 31 pages.

Non-Final Office Action dated Dec. 5, 2013, issued in connection with U.S. Appl. No. 13/827,653, filed Mar. 14, 2013, 28 pages.

Non-Final Office Action dated Jan. 5, 2012, issued in connection with U.S. Appl. No. 13/298,090, filed Nov. 16, 2011, 40 pages.

Non-Final Office Action dated May 6, 2014, issued in connection with U.S. Appl. No. 13/705,176, filed Dec. 5, 2012, 23 pages.

Non-Final Office Action dated Jan. 7, 2014, issued in connection with U.S. Appl. No. 13/896,829, filed May 17, 2013, 11 pages.

Non-Final Office Action dated Sep. 7, 2016, issued in connection with U.S. Appl. No. 13/864,248, filed Apr. 17, 2013, 12 pages.

Non-final Office Action dated Apr. 10, 2013, issued in connection with U.S. Appl. No. 13/619,237, filed Sep. 14, 2012, 10 pages.

Non-Final Office Action dated Feb. 10, 2014, issued in connection with U.S. Appl. No. 13/083,499, filed Apr. 8, 2011, 12 pages.

Non-Final Office Action dated May 12, 2014, issued in connection with U.S. Appl. No. 14/184,528, filed Feb. 19, 2014, 23 pages.

Non-Final Office Action dated May 14, 2014, issued in connection with U.S. Appl. No. 13/848,932, filed Mar. 22, 2013, 14 pages.

Non-Final Office Action dated Jun. 17, 2014, issued in connection with U.S. Appl. No. 14/176,808, filed Feb. 10, 2014, 6 pages.

Non-Final Office Action dated Dec. 18, 2013, issued in connection with U.S. Appl. No. 13/907,666, filed May 31, 2013, 12 pages.

Non-Final Office Action dated Jan. 18, 2008, issued in connection with U.S. Appl. No. 10/816,217, filed Apr. 1, 2004, 38 pages.

Non-Final Office Action dated Apr. 19, 2010, issued in connection with U.S. Appl. No. 11/801,468, filed May 9, 2007, 16 pages.

Non-Final Office Action dated Mar. 19, 2013, issued in connection with U.S. Appl. No. 13/724,048, filed Dec. 21, 2012, 9 pages.

Non-Final Office Action dated Jun. 21, 2011, issued in connection with U.S. Appl. No. 10/816,217, filed Apr. 1, 2004, 13 pages.

Non-Final Office Action dated Jan. 22, 2009, issued in connection with U.S. Appl. No. 10/816,217, filed Apr. 1, 2004, 18 pages.

Non-Final Office Action dated Jul. 23, 2014, issued in connection with U.S. Appl. No. 14/256,434, filed Apr. 18, 2014, 12 pages.

Non-Final Office Action dated Jul. 25, 2014, issued in connection with U.S. Appl. No. 14/184,526, filed Feb. 19, 2014, 9 pages.

Non-Final Office Action dated Jul. 25, 2014, issued in connection with U.S. Appl. No. 14/184,935, filed Feb. 20, 2014, 11 pages.

Non-Final Office Action dated Jun. 25, 2010, issued in connection with U.S. Appl. No. 10/816,217, filed Apr. 1, 2004, 17 pages.

Non-Final Office Action dated Nov. 25, 2013, issued in connection with U.S. Appl. No. 13/533,105, filed Jun. 26, 2012, 19 pages.

Notice of Allowance dated Jul. 2, 2015, issued in connection with U.S. Appl. No. 14/184,935, filed Feb. 20, 2014, 23 pages.

Notice of Allowance dated Jun. 2, 2014, issued in connection with U.S. Appl. No. 13/083,499, filed Apr. 8, 2011, 5 pages.

Notice of Allowance dated Sep. 3, 2015, issued in connection with U.S. Appl. No. 13/705,174, filed Dec. 5, 2012, 4 pages.

Notice of Allowance dated Aug. 4, 2015, issued in connection with U.S. Appl. No. 14/516,867, filed Oct. 17, 2014, 13 pages.

Notice of Allowance dated Dec. 5, 2014, issued in connection with U.S. Appl. No. 14/256,434, filed Apr. 18, 2014, 7 pages.

Notice of Allowance dated Oct. 5, 2012, issued in connection with U.S. Appl. No. 13/204,511, filed Aug. 5, 2011, 11 pages.

Notice of Allowance dated Mar. 6, 2014, issued in connection with U.S. Appl. No. 13/827,653, filed Mar. 14, 2013, 17 pages.

Notice of Allowance dated May 6, 2011, issued in connection with U.S. Appl. No. 11/801,468, filed May 9, 2007, 10 pages.

Notice of Allowance dated Sep. 6, 2013, issued in connection with U.S. Appl. No. 13/619,237, filed Sep. 14, 2012, 10 pages.

Notice of Allowance dated Sep. 6, 2016, issued in connection with U.S. Appl. No. 15/134,767, filed Apr. 21, 2016, 7 pages.

Notice of Allowance dated Apr. 7, 2016, issued in connection with U.S. Appl. No. 13/533,105, filed Jun. 26, 2012, 40 pages.

Notice of Allowance dated Oct. 7, 2015, issued in connection with U.S. Appl. No. 14/184,526, filed Feb. 19, 2014, 7 pages.

Notice of Allowance dated Oct. 9, 2015, issued in connection with U.S. Appl. No. 13/435,739, filed Mar. 30, 2012, 4 pages.

Notice of Allowance dated Sep. 9, 2016, issued in connection with U.S. Appl. No. 15/134,761, filed Apr. 21, 2016, 7 pages.

Notice of Allowance dated Mar. 1, 2018, issued in connection with U.S. Appl. No. 14/619,813, filed Feb. 11, 2015, 7 pages.

Notice of Allowance dated Aug. 10, 2015, issued in connection with U.S. Appl. No. 13/848,904, filed Mar. 22, 2013, 9 pages.

Notice of Allowance dated Jul. 10, 2015, issued in connection with U.S. Appl. No. 13/013,740, filed Jan. 25, 2011, 7 pages.

Notice of Allowance dated Jun. 10, 2019, issued in connection with U.S. Appl. No. 16/128,443, filed Sep. 11, 2018, 10 pages.

Notice of Allowance dated Mar. 10, 2016, issued in connection with U.S. Appl. No. 14/937,523, filed Nov. 10, 2015, 5 pages.

Notice of Allowance dated Nov. 10, 2011, issued in connection with U.S. Appl. No. 11/906,702, filed Oct. 2, 2007, 17 pages.

Notice of Allowance dated Sep. 10, 2014, issued in connection with U.S. Appl. No. 13/892,230, filed May 10, 2013, 5 pages.

Notice of Allowance dated Sep. 10, 2018, issued in connection with U.S. Appl. No. 14/629,937, filed Feb. 24, 2015, 7 pages.

Notice of Allowance dated Apr. 11, 2016, issued in connection with U.S. Appl. No. 13/864,247, filed Apr. 17, 2013, 21 pages.

Notice of Allowance dated Jan. 11, 2016, issued in connection with U.S. Appl. No. 14/564,544, filed Dec. 9, 2014, 5 pages.

Notice of Allowance dated Jul. 11, 2017, issued in connection with U.S. Appl. No. 14/825,961, filed Aug. 13, 2015, 5 pages.

Notice of Allowance dated Aug. 12, 2015, issued in connection with U.S. Appl. No. 13/435,739, filed Mar. 30, 2012, 27 pages.

Notice of Allowance dated Jun. 12, 2014, issued in connection with U.S. Appl. No. 13/896,829, filed May 17, 2013, 5 pages.

Notice of Allowance dated Jul. 13, 2015, issued in connection with U.S. Appl. No. 14/184,526, filed Feb. 19, 2014, 22 pages.

Notice of Allowance dated May 13, 2015, issued in connection with U.S. Appl. No. 14/299,847, filed Jun. 9, 2014, 10 pages.

Notice of Allowance dated Nov. 13, 2013, issued in connection with U.S. Appl. No. 13/724,048, filed Dec. 21, 2012, 7 pages.

Notice of Allowance dated Nov. 13, 2017, issued in connection with U.S. Appl. No. 14/563,515, filed Dec. 8, 2014, 11 pages.

Notice of Allowance dated Oct. 13, 2015, issued in connection with U.S. Appl. No. 13/864,251, filed Apr. 17, 2013, 7 pages.

Notice of Allowance dated Jun. 14, 2012, issued in connection with U.S. Appl. No. 12/035,112, filed Feb. 21, 2008, 9 pages.

Notice of Allowance dated Jan. 15, 2019, issued in connection with U.S. Appl. No. 15/487,686, filed Apr. 14, 2017, 8 pages.

Notice of Allowance dated Jul. 15, 2015, issued in connection with U.S. Appl. No. 13/705,174, filed Dec. 5, 2012, 18 pages.

Notice of Allowance dated Mar. 15, 2016, issued in connection with U.S. Appl. No. 14/937,571, filed Nov. 10, 2015, 5 pages.

Notice of Allowance dated Jun. 16, 2009, issued in connection with U.S. Appl. No. 10/861,653, filed Jun. 5, 2004, 11 pages.

Notice of Allowance dated May 16, 2017, issued in connection with U.S. Appl. No. 15/228,685, filed Aug. 4, 2016, 10 pages.

US 10,469,966 B2

Page 14

(56)

References Cited

OTHER PUBLICATIONS

- Notice of Allowance dated Jul. 17, 2015, issued in connection with U.S. Appl. No. 13/864,251, filed Apr. 17, 2013, 20 pages.
- Notice of Allowance dated Aug. 19, 2016, issued in connection with U.S. Appl. No. 14/619,813, filed Feb. 11, 2015, 9 pages.
- Notice of Allowance dated May 19, 2015, issued in connection with U.S. Appl. No. 13/907,666, filed May 31, 2013, 7 pages.
- Notice of Allowance dated Oct. 19, 2016, issued in connection with U.S. Appl. No. 14/290,493, filed May 29, 2014, 14 pages.
- Notice of Allowance dated Jan. 20, 2016, issued in connection with U.S. Appl. No. 14/465,457, filed Aug. 21, 2014, 10 pages.
- Notice of Allowance dated Oct. 21, 2015, issued in connection with U.S. Appl. No. 14/174,244, filed Feb. 6, 2014, 5 pages.
- Notice of Allowance dated Oct. 21, 2015, issued in connection with U.S. Appl. No. 14/174,253, filed Feb. 6, 2014, 6 pages.
- Notice of Allowance dated Sep. 21, 2015, issued in connection with U.S. Appl. No. 13/297,000, filed Nov. 15, 2011, 11 pages.
- Notice of Allowance dated Jan. 22, 2015, issued in connection with U.S. Appl. No. 13/630,565, filed Sep. 28, 2012, 7 pages.
- Notice of Allowance dated Sep. 22, 2015, issued in connection with U.S. Appl. No. 13/888,203, filed May 6, 2013, 7 pages.
- Notice of Allowance dated May 24, 2017, issued in connection with U.S. Appl. No. 14/806,070, filed Jul. 22, 2015, 5 pages.
- Notice of Allowance dated Oct. 24, 2016, issued in connection with U.S. Appl. No. 15/134,761, filed Apr. 21, 2016, 7 pages.
- Hans et al., "Interacting with Audio Streams for Entertainment and Communication," Proceedings of the Eleventh ACM International Conference on Multimedia, ACM, 2003, 7 pages.
- Herre et al., "The Reference Model Architecture for MPEG Spatial Audio Coding," Audio Engineering Society Convention Paper (Presented at the 118th Convention), May 28-31, 2005, 13 pages.
- Home Networking with Universal Plug and Play, IEEE Communications Magazine, vol. 39 No. 12 (Dec. 2001) (D+M_0402025-40) (16 pages).
- "Home Theater Control Systems," Cinema Source, 2002, 19 pages.
- Horwitz, Jeremy, "Logic3 i-Station25," retrieved from the internet: <http://www.ilounge.com/index.php/reviews/entry/logic3-i-station25/>, last visited Dec. 17, 2013, 5 pages.
- Huang C.M., et al., "A Synchronization Infrastructure for Multicast Multimedia at the Presentation Layer," IEEE Transactions on Consumer Electronics, 1997, pp. 370-380, vol. 43, No. 3.
- IBM Home Director Installation and Service Manual, Copyright 1998, 124 pages.
- IBM Home Director Owner's Manual, Copyright 1999, 67 pages.
- ID3 tag version 2.4.0—Native Frames, Draft Specification, copyright 2000, 41 pages.
- Implicit, LLC v. Sonos, Inc.*, Defendant's Original Complaint (Mar. 3, 2017) (15 pages).
- Integra Audio Network Receiver NAC 2.3 Instruction Manual, 68 pages.
- Integra Audio Network Server NAS 2.3 Instruction Manual, pp. 1-32.
- Integra Service Manual, Audio Network Receiver Model NAC-2.3, Dec. 2002, 44 pages.
- Intel Designing a UPnP AV Media Renderer, v. 1.0 ("Intel AV Media Renderer") (May 20, 2003) (SONDM000115117-62) (46 pages).
- Intel Media Renderer Device Interface ("Intel Media Renderer") (Sep. 6, 2002) (62 pages).
- Intel SDK for UPnP Devices Programming Guide, Version 1.2.1, (Nov. 2002) (30 pages).
- International Bureau, International Preliminary Report on Patentability dated Jan. 8, 2015, issued in connection with International Application No. PCT/US2013/046372, filed on Jun. 18, 2013, 6 pages.
- International Bureau, International Preliminary Report on Patentability, dated Jan. 8, 2015, issued in connection with International Application No. PCT/US2013/046386, filed on Jun. 18, 2013, 8 pages.
- International Bureau, International Preliminary Report on Patentability, dated Oct. 17, 2013, issued in connection with International Application No. PCT/IB2012/052071, filed on Apr. 26, 2012, 7 pages.
- International Bureau, International Preliminary Report on Patentability dated Jan. 30, 2014, issued in connection with International Application No. PCT/US2012/045894, filed on Jul. 9, 2012, 6 pages.
- International Searching Authority, International Search Report dated Aug. 1, 2008, in connection with International Application No. PCT/US2004/023102, 5 pages.
- International Searching Authority, International Search Report dated Aug. 23, 2012, issued in connection with International Application No. PCT/IB2012/052071, filed on Apr. 26, 2012, 3 pages.
- International Searching Authority, International Search Report dated Aug. 26, 2013, issued in connection with International Application No. PCT/US2013/046372, filed on Jun. 18, 2013, 3 pages.
- International Searching Authority, International Search Report dated Dec. 26, 2012, issued in connection with International Application No. PCT/US2012/045894, filed on Jul. 9, 2012, 3 pages.
- International Searching Authority, International Search Report dated Sep. 30, 2013, issued in connection with International Application No. PCT/US2013/046386, filed on Jun. 18, 2013, 3 pages.
- International Searching Authority, Written Opinion dated Aug. 23, 2012, issued in connection with International Application No. PCT/IB2012/052071, filed on Apr. 26, 2012, 6 pages.
- International Searching Authority, Written Opinion dated Aug. 26, 2013, issued in connection with International Application No. PCT/US2013/046372, filed on Jun. 18, 2013, 4 pages.
- International Searching Authority, Written Opinion dated Dec. 26, 2012, issued in connection with International Application No. PCT/US2012/045894, filed on Jul. 9, 2012, 4 pages.
- International Searching Authority, Written Opinion dated Sep. 30, 2013, issued in connection with International Application No. PCT/US2013/046386, filed on Jun. 18, 2013, 6 pages.
- Ishibashi et al., "A Comparison of Media Synchronization Quality Among Reactive Control Schemes," IEEE Infocom, 2001, pp. 77-84.
- Ishibashi et al., "A Group Synchronization Mechanism for Live Media in Multicast Communications," IEEE Global Telecommunications Conference, 1997, pp. 746-752, vol. 2.
- Ishibashi et al., "A Group Synchronization Mechanism for Stored Media in Multicast Communications," IEEE Information Revolution and Communications, 1997, pp. 692-700, vol. 2.
- Issues with Mixed IEEE 802.b/802.11g Networks, AVAGO0058, Agere Systems, Feb. 2004, 5 pages.
- Japanese Patent Office, Decision of Rejection dated Jul. 8, 2014, issued in connection with Japanese Patent Application No. 2012-178711, 3 pages.
- Japanese Patent Office, Final Office Action dated Jun. 4, 2019, issued in connection with Japanese Patent Application No. 2017-211958, 8 pages.
- Japanese Patent Office, Notice of Rejection, dated Feb. 3, 2015, issued in connection with Japanese Patent Application No. 2014-521648, 7 pages.
- Japanese Patent Office, Notice of Rejection dated Sep. 15, 2015, issued in connection with Japanese Patent Application No. 2014-220704, 7 pages.
- Japanese Patent Office, Office Action dated Nov. 1, 2016, issued in connection with Japanese Application No. 2015-238682, 7 pages.
- Japanese Patent Office, Office Action dated Jan. 6, 2015, issued in connection with Japanese Patent Application No. 2014-503273, 5 pages.
- Japanese Patent Office, Office Action Dec. 18, 2018, issued in connection with Japanese Application No. 2017-211958, 8 pages.
- Japanese Patent Office, Office Action dated May 24, 2016, issued in connection with Japanese Patent Application No. 2014-220704, 7 pages.
- Japanese Patent Office, Office Action dated Mar. 29, 2016, issued in connection with Japanese Patent Application No. JP2015-520288, 12 pages.

US 10,469,966 B2

Page 15

(56)

References Cited

OTHER PUBLICATIONS

Japanese Patent Office, Office Action Summary dated Feb. 2, 2016, issued in connection with Japanese Patent Application No. 2015-520286, 6 pages.

Japanese Patent Office, Office Action Summary dated Sep. 8, 2015, issued in connection with Japanese Patent Application No. 2014-503273, 4 pages.

Japanese Patent Office, Office Action Summary dated Nov. 2013, issued in connection with Japanese Patent Application No. 2012-178711, 5 pages.

Japanese Patent Office, Translation of Office Action dated Dec. 18, 2018, issued in connection with Japanese Application No. 2017-211958, 6 pages.

Jo et al., "Synchronized One-to-many Media Streaming with Adaptive Playout Control," Proceedings of SPIE, 2002, pp. 71-82, vol. 4861.

Jones, Stephen, "Dell Digital Audio Receiver: Digital upgrade for your analog stereo," Analog Stereo, Jun. 24, 2000 retrieved Jun. 18, 2014, 2 pages.

Kou et al., "RenderingControl:1 Service Template Verion 1.01," Contributing Members of the UPnP Forum, Jun. 25, 2002, 63 pages.

Lake Processors: Lake® LM Series Digital Audio Processors Operation Manual, 2011, 71 pages.

Reid, Mark, "Multimedia conferencing over ISDN and IP networks using ITU-T H-series recommendations: architecture, control and coordination," Computer Networks, 1999, pp. 225-235, vol. 31.

RenderingControl:1 Service Template Version 1.01 for UPnP, Version 1.0, (Jun. 25, 2002) (SONDM000115187-249) (63 pages).

Renewed Request for Ex Parte Re-Examination, U.S. Appl. No. 90/013,959 filed Jun. 16, 2017, 126 pages.

Renkus Heinz Manual; available for sale at least 2004, 6 pages.

Request for Ex Parte Reexamination submitted in U.S. Pat. No. 9,213,357 on May 22, 2017, 85 pages.

"Residential Distributed Audio Wiring Practices," Leviton Network Solutions, 2001, 13 pages.

Ritchie et al., "MediaServer:1 Device Template Version 1.01," Contributing Members of the UPnP Forum, Jun. 25, 2002, 12 pages.

Ritchie et al., "UPnP AV Architecture:1, Version 1.0," Contributing Members of the UPnP Forum, Jun. 25, 2002, 22 pages.

Ritchie, John, "MediaRenderer:1 Device Template Version 1.01," Contributing Members of the UPnP Forum, Jun. 25, 2002, 12 pages.

Roland Corporation, "Roland announces BA-55 Portable PA System," press release, Apr. 6, 2011, 2 pages.

Rothermel et al., "An Adaptive Protocol for Synchronizing Media Streams," Institute of Parallel and Distributed High-Performance Systems (IPVR), 1997, 26 pages.

Rothermel et al., "An Adaptive Stream Synchronization Protocol," 5th International Workshop on Network and Operating System Support for Digital Audio and Video, 1995, 13 pages.

Rothermel et al., "An Adaptive Stream Synchronization Protocol," 5th International Workshop on Network and Operating System Support for Digital Audio and Video, Apr. 18-21, 1995, 12 pages.

Rothermel et al., "Clock Hierarchies—An Abstraction for Grouping and Controlling Media Streams," University of Stuttgart Institute of Parallel and Distributed High-Performance Systems, Jan. 1996, 23 pages.

Rothermel et al., "Synchronization in Joint-Viewing Environments," University of Stuttgart Institute of Parallel and Distributed High-Performance Systems, 1992, 13 pages.

Rothermel, Kurt, "State-of-the-Art and Future Research in Stream Synchronization," University of Stuttgart, 3 pages.

"RVL-6 Modular Multi-Room Controller, Installation & Operation Guide," Nile Audio Corporations, 1999, 46 pages.

Schmandt et al., "Impromptu: Managing Networked Audio Applications for Mobile Users," 2004, 11 pages.

Schulzrinne et al., "RTP: A Transport Protocol for Real-Time Applications," Network Working Group, RFC: 3550, Standards Track, Jul. 2003, 104 pages.

Schulzrinne H., et al., "RTP: A Transport Protocol for Real-Time Applications, RFC 3550," Network Working Group, 2003, pp. 1-89.

Simple Network Time Protocol (SNTP), RFC 1361 (Aug. 1992) (D+M_0397537-46) (10 pages).

Simple Network Time Protocol (SNTP), RFC 1769 (Mar. 1995) (D+M_0397663-76) (14 pages).

Simple Service Discovery Protocol/1.0 Operating without an Arbiter (Oct. 28, 1999) (24 pages).

Sonos Controller for iPad Product Guide; copyright 2004-2013; 47 pages.

Sonos Digital Music System User Guide, Version: 050801, Aug. 2005, 114 pages.

Sonos, Inc. v. D&M Holdings, D&M Supp Opposition Brief including Exhibits, Mar. 17, 2017, 23 pages.

Sonos, Inc. v. D&M Holdings, Expert Report of Jay P. Kesan including Appendices A-P, Feb. 20, 2017, 776 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Complaint for Patent Infringement, filed Oct. 21, 2014, 20 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Amended Invalidity Contentions, filed Sep. 14, 2016, 100 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Initial Invalidity Contentions, filed Apr. 15, 2016, 97 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Preliminary Identification of Indefinite Terms, provided Jul. 29, 2016, 8 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendants' 35 U.S.C. § 282 Notice filed Nov. 2, 2017, 31 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendant's Amended Answer, Defenses, and Counterclaims for Patent Infringement, filed Nov. 30, 2015, 47 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendants' Answer to Plaintiff's Second Amended Complaint, filed Apr. 30, 2015, 19 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendants' First Amended Answer to Plaintiff's Third Amended Complaint, filed Sep. 7, 2016, 23 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Defendants' Reply in Support of Partial Motion for Judgement on the Pleadings, filed Jun. 10, 2016, 15 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Exhibit A: Defendants' First Amended Answer to Plaintiffs' Third Amended Complaint, provided Aug. 1, 2016, 26 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Exhibit A: Defendants' Second Amended Answer to Plaintiffs' Third Amended Complaint, filed Sep. 9, 2016, 43 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Exhibit A: Defendants' Second Amended Answer to Plaintiffs' Third Amended Complaint, provided Sep. 9, 2016, 88 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., First Amended Complaint for Patent Infringement, filed Dec. 17, 2014, 26 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Joint Claim Construction Chart, vol. 1 of 3 with Exhibits A-O, filed Aug. 17, 2016, 30 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Opening Brief in Support of Defendants' Partial Motion for Judgement on the Pleadings for Lack of Patent-Eligible Subject Matter, filed May 6, 2016, 27 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Plaintiff Sonos, Inc.'s Opening Claim Construction Brief, filed Sep. 9, 2016, 26 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Plaintiff Sonos, Inc.'s Response in Opposition to Defendants' Partial Motion for Judgment on the Pleadings, filed May 27, 2016, 24 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Reply Brief in Support of Defendants' Motion for Leave to Amend their Answer to Add the Defense of Inequitable Conduct, provided Nov. 10, 2016, 16 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Reply Brief in Support of Defendants' Motion for Leave to Amend their Answer to Add the Defense of Inequitable Conduct, provided Sep. 9, 2016, 16 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Second Amended Complaint for Patent Infringement, filed Feb. 27, 2015, 49 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Sonos's Motion to Strike Defendants' New Amended Answer Submitted with their Reply Brief, provided Sep. 15, 2016, 10 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Sonos's Opposition to Defendants' Motion for Leave to Amend their Answer to Add the Defense of Inequitable Conduct, provided Oct. 31, 2016, 26 pages.

Sonos, Inc. v. D&M Holdings Inc. et al., Third Amended Complaint for Patent Infringement, filed Jan. 29, 2016, 47 pages.

US 10,469,966 B2

Page 16

(56)

References Cited

OTHER PUBLICATIONS

- Final Office Action dated Mar. 27, 2014, issued in connection with U.S. Appl. No. 13/533,105, filed Jun. 26, 2012, 29 pages.
- Final Office Action dated Jan. 28, 2011, issued in connection with U.S. Appl. No. 10/816,217, filed Apr. 1, 2004, 21 pages.
- Final Office Action dated Jun. 30, 2008, issued in connection with U.S. Appl. No. 10/816,217, filed Apr. 1, 2004, 30 pages.
- Final Office Action dated Jul. 1, 2016, issued in connection with U.S. Appl. No. 13/458,558, filed Apr. 27, 2012, 11 pages.
- Final Office Action dated Jul. 2, 2015, issued in connection with U.S. Appl. No. 13/458,558, filed Apr. 27, 2012, 11 pages.
- Final Office Action dated Aug. 3, 2015, issued in connection with U.S. Appl. No. 13/848,921, filed Mar. 22, 2013, 13 pages.
- Final Office Action dated Dec. 3, 2014, issued in connection with U.S. Appl. No. 14/184,528, filed Feb. 19, 2014, 12 pages.
- Final Office Action dated Jul. 3, 2012, issued in connection with U.S. Appl. No. 13/298,090, filed Nov. 16, 2011, 46 pages.
- Final Office Action dated Jun. 3, 2016, issued in connection with U.S. Appl. No. 13/705,176, filed Dec. 5, 2012, 24 pages.
- Final Office Action dated Mar. 3, 2015, issued in connection with U.S. Appl. No. 13/864,251, filed Apr. 17, 2013, 13 pages.
- Final Office Action dated Mar. 4, 2015, issued in connection with U.S. Appl. No. 13/848,904, filed Mar. 22, 2013, 16 pages.
- Final Office Action dated Mar. 5, 2015, issued in connection with U.S. Appl. No. 13/888,203, filed May 6, 2013, 13 pages.
- Final Office Action dated Jan. 7, 2017, issued in connection with U.S. Appl. No. 13/848,932, filed Mar. 22, 2013, 14 pages.
- Final Office Action dated Mar. 9, 2015, issued in connection with U.S. Appl. No. 14/516,867, filed Oct. 17, 2014, 14 pages.
- Final Office Action dated Aug. 10, 2015, issued in connection with U.S. Appl. No. 14/290,493, filed May 29, 2014, 26 pages.
- Final Office Action dated Feb. 10, 2014, issued in connection with U.S. Appl. No. 13/013,740, filed Jan. 25, 2011, 13 pages.
- Final Office Action dated Aug. 11, 2015, issued in connection with U.S. Appl. No. 13/864,247, filed Apr. 17, 2013, 15 pages.
- Final Office Action dated Feb. 11, 2015, issued in connection with U.S. Appl. No. 14/184,526, filed Feb. 19, 2014, 13 pages.
- Final Office Action dated Feb. 11, 2015, issued in connection with U.S. Appl. No. 14/184,935, filed Feb. 20, 2014, 17 pages.
- Final Office Action dated Feb. 12, 2015, issued in connection with U.S. Appl. No. 14/184,522, filed Feb. 17, 2014, 20 pages.
- Final Office Action dated Apr. 13, 2017, issued in connection with U.S. Appl. No. 14/563,515, filed Dec. 8, 2014, 13 pages.
- Final Office Action dated Dec. 13, 2016, issued in connection with U.S. Appl. No. 14/629,937, filed Feb. 24, 2015, 14 pages.
- Final Office Action dated Oct. 13, 2011, issued in connection with U.S. Appl. No. 11/853,790, filed Sep. 11, 2007, 10 pages.
- Final Office Action dated Oct. 13, 2011, issued in connection with U.S. Appl. No. 12/035,112, filed Feb. 21, 2008, 10 pages.
- Final Office Action dated Nov. 14, 2018, issued in connection with U.S. Appl. No. 15/130,919, filed Apr. 15, 2016, 12 pages.
- Final Office Action dated Jul. 15, 2015, issued in connection with U.S. Appl. No. 14/504,812, filed Oct. 2, 2014, 18 pages.
- Final Office Action dated Jun. 15, 2015, issued in connection with U.S. Appl. No. 14/184,522, filed Feb. 19, 2014, 25 pages.
- Final Office Action dated Dec. 17, 2014, issued in connection with U.S. Appl. No. 13/533,105, filed Jun. 26, 2012, 36 pages.
- Final Office Action dated Oct. 19, 2016, issued in connection with U.S. Appl. No. 13/848,921, filed Mar. 22, 2013, 14 pages.
- Final Office Action dated Jan. 21, 2010, issued in connection with U.S. Appl. No. 11/906,702, filed Oct. 2, 2007, 27 pages.
- Final Office Action dated Oct. 22, 2014, issued in connection with U.S. Appl. No. 14/186,850, filed Feb. 21, 2014, 12 pages.
- Final Office Action dated Oct. 23, 2014, issued in connection with U.S. Appl. No. 13/705,176, filed Dec. 5, 2012, 23 pages.
- Final Office Action dated Feb. 24, 2016, issued in connection with U.S. Appl. No. 13/871,795, filed Apr. 26, 2013, 28 pages.
- Final Office Action dated May 25, 2016, issued in connection with U.S. Appl. No. 14/290,493, filed May 29, 2014, 33 pages.
- Final Office Action dated Apr. 28, 2015, issued in connection with U.S. Appl. No. 14/186,850, filed Feb. 21, 2014, 20 pages.
- Final Office Action dated Jun. 29, 2015, issued in connection with U.S. Appl. No. 14/465,457, filed Aug. 21, 2014, 13 pages.
- Final Office Action dated Jan. 3, 2019, issued in connection with U.S. Appl. No. 15/405,931, filed Jan. 13, 2017, 16 pages.
- Final Office Action dated Nov. 30, 2015, issued in connection with U.S. Appl. No. 13/871,795, filed Apr. 26, 2013, 26 pages.
- Final Office Action dated Apr. 6, 2017, issued in connection with U.S. Appl. No. 14/620,937, filed Feb. 12, 2015, 15 pages.
- Final Office Action dated Dec. 7, 2017, issued in connection with U.S. Appl. No. 14/619,813, filed Feb. 11, 2015, 11 pages.
- Fireball DVD and Music Manager DVD/100 Installation and User's Guide, Copyright 2003, 185 pages.
- Fireball MP-200 User's Manual, Copyright 2006, 93 pages.
- Fireball Remote Control Guide WD006-1-1, Copyright 2003, 19 pages.
- Fireball SE-D1 User's Manual, Copyright 2005, 90 pages.
- First Action Interview Office Action Summary dated Apr. 15, 2015, issued in connection with U.S. Appl. No. 14/505,027, filed Oct. 2, 2014, 6 pages.
- Fober et al., "Clock Skew Compensation over a High Latency Network," Proceedings of the ICMC, 2002, pp. 548-552.
- Fries et al., "The MP3 and Internet Audio Handbook: Your Guide to the Digital Music Revolution." 2000, 320 pages.
- Fulton et al., "The Network Audio System: Make Your Application Sing (as Well as Dance)!" The X Resource, 1994, 14 pages.
- Gaston et al., "Methods for Sharing Stereo and Multichannel Recordings Among Planetariums," Audio Engineering Society Convention Paper 7474, 2008, 15 pages.
- General Event Notification Architecture Base: Client to Arbiter (Apr. 2000) (23 pages).
- Sony: AIR-SA 50R Wireless Speaker, Copyright 2009, 2 pages.
- Sony: Altus Quick Setup Guide ALT-SA32PC, Copyright 2009, 2 pages.
- Sony: BD/DVD Home Theatre System Instruction for BDV-E300, E301 and E801, Copyright 2009, 115 pages.
- Sony: BD/DVD Home Theatre System Operating Instructions for BDV-IT1000/BDV-IS1000, Copyright 2008, 159 pages.
- Sony: Blu-ray Disc/DVD Home Theatre System Operating Instructions for BDV-IZ1000W, Copyright 2010, 88 pages.
- Sony: DVD Home Theatre System Operating Instructions for DAV-DZ380W/DZ680W/DZ880W, Copyright 2009, 136 pages.
- Sony: DVD Home Theatre System Operating Instructions for DAV-DZ870W, Copyright 2008, 128 pages.
- Sony Ericsson MS500 User Guide, Copyright 2009, 2 pages.
- Sony: Home Theatre System Operating Instructions for HT-IS100, Copyright 2008, 168 pages.
- Sony HT-IS100, 5.1 Channel Audio System, last updated Nov. 2009, 2 pages.
- Sony: Multi Channel AV Receiver Operating Instructions, 2007, 80 pages.
- Sony: Multi Channel AV Receiver Operating Instructions for STR-DN1000, Copyright 2009, 136 pages.
- Sony: STR-DN1000, Audio Video Receiver, last updated Aug. 2009, 2 pages.
- Sony: Wireless Surround Kit Operating Instructions for WHAT-SA2, Copyright 2010, 56 pages.
- Taylor, Marilou, "Long Island Sound," Audio Video Interiors, Apr. 2000, 8 pages.
- Third Party Request for Ex Parte Re-Examination, U.S. Appl. No. 90/013,859 filed Nov. 7, 2016, 424 pages.
- TOA Corporation, Digital Processor DP-0206 DACsys2000 Version 2.00 Software Instruction Manual, Copyright 2001, 67 pages.
- Understanding Universal Plug and Play, Microsoft White Paper (Jun. 2000) (D+M_0402074-118) (45 pages).
- United States Patent and Trademark Office, U.S. Appl. No. 60/490,768, filed Jul. 28, 2003, entitled "Method for synchronizing audio playback between multiple networked devices," 13 pages.
- United States Patent and Trademark Office, U.S. Appl. No. 60/825,407, filed Sep. 12, 2006, entitled "Controlling and manipulating groupings in a multi-zone music or media system," 82 pages.

US 10,469,966 B2

Page 17

(56)

References Cited

OTHER PUBLICATIONS

- Universal Plug and Play Device Architecture V. 1.0, (Jun. 8, 2000) (54 pages).
- Universal Plug and Play in Windows XP, Tom Fout, Microsoft Corporation (Jul. 2001) (D+M_0402041-73) (33 pages).
- Universal Plug and Play (“UPnP”) AV Architecture:1 for UPnP, Version 1.0, (Jun. 25, 2002) (D+M_0298151-72) (22 pages).
- Universal Plug and Play Vendor’s Implementation Guide (Jan. 5, 2000) (7 pages).
- UPnP AV Architecture:0.83 (Jun. 12, 2002) (SONDM000115483-504) (22 pages).
- UPnP Design by Example, A Software Developers Guide to Universal Plug and Play Michael Jeronimo and JackWeast, Intel Press (D+M_0401307-818) (Apr. 2003) (511 pages).
- UPnP; “Universal Plug and Play Device Architecture,” Jun. 8, 2000; version 1.0; Microsoft Corporation; pp. 1-54.
- U.S. Appl. No. 13/083,499, filed Apr. 8, 2011, “Multi-Channel Pairing in a Media System.”
- WANCommonInterfaceConfig:1 Service Template Version 1.01 for UPnP, Ver. 1.0 (Nov. 12, 2001) (D+M_0401820-43) (24 pages).
- WANIPConnection:1 Service Template Version 1.01 for UPnP Ver. 1.0 (Nov. 12, 2001) (D+M_0401844-917) (74 pages).
- WANPPPConnection:1 Service Template Version 1.01 for UPnP, Version 1.0 (Nov. 12, 2001) (D+M_0401918-2006) (89 pages).
- WaveLAN High-Speed Multimode Chip Set, AVAGO0003, Agere Systems, Feb. 2003, 4 pages.
- WaveLAN High-Speed Multimode Chip Set, AVAGO0005, Agere Systems, Feb. 2003, 4 pages.
- WaveLAN Wireless Integration Developer Kit (WI-DK) for Access Point Developers, AVAGO0054, Agere Systems, Jul. 2003, 2 pages.
- WaveLAN Wireless Integration-Developer Kit (WI-DK) Hardware Control Function (HCF), AVAGO0052, Agere Systems, Jul. 2003, 2 pages.
- “Welcome. You’re watching Apple TV.” Apple TV 1st Generation Setup Guide, Apr. 8, 2008 Retrieved Oct. 14, 2014, 40 pages.
- “Welcome. You’re watching Apple TV.” Apple TV 2nd Generation Setup Guide, Mar. 10, 2011 Retrieved Oct. 16, 2014, 36 pages.
- “Welcome. You’re watching Apple TV.” Apple TV 3rd Generation Setup Guide, Mar. 16, 2012 Retrieved Oct. 16, 2014, 36 pages.
- WI-DK Release 2 WaveLAN Embedded Drivers for VxWorks and Linux, AVAGO0056, Agere Systems, Jul. 2003, 2 pages.
- WI-DK Release 2 WaveLAN END Reference Driver for VxWorks, AVAGO0044, Agere Systems, Jul. 2003, 4 pages.
- WI-DK Release 2 WaveLAN LKM Reference Drivers for Linux, AVAGO0048, Agere Systems, Jul. 2003, 4 pages.
- Windows Media Connect Device Compatibility Specification (Apr. 12, 2004) (16 pages).
- WPA Reauthentication Rates, AVAGO0063, Agere Systems, Feb. 2004, 3 pages.
- Yamaha DME 32 manual: copyright 2001.
- Yamaha DME 64 Owner’s Manual; copyright 2004, 80 pages.
- Yamaha DME Designer 3.5 setup manual guide; copyright 2004, 16 pages.
- Yamaha DME Designer 3.5 User Manual; Copyright 2004, 507 pages.
- Yamaha DME Designer software manual: Copyright 2004, 482 pages.
- “Symantec pcAnywhere User’s Guide,” v 10.5.1, 1995-2002, 154 pages.
- “Systemline Modular Installation Guide, Multiroom System,” Systemline, 2003, pp. 1-22.
- “884+ Automatic Matrix Mixer Control System,” Ivie Technologies, Inc., 2000, pp. 1-4.
- Advanced Driver Tab User Interface WaveLAN GUI Guide, AVAGO0009, Agere Systems, Feb. 2004, 4 pages.
- Advisory Action dated Feb. 2, 2016, issued in connection with U.S. Appl. No. 13/848,921, filed Mar. 22, 2013, 8 pages.
- Advisory Action dated Sep. 18, 2008, issued in connection with U.S. Appl. No. 10/816,217, filed Apr. 1, 2004, 8 pages.
- Advisory Action dated Feb. 1, 2016, issued in connection with U.S. Appl. No. 13/864,247, filed Apr. 17, 2013, 6 pages.
- Advisory Action dated Jun. 1, 2015, issued in connection with U.S. Appl. No. 14/516,867, filed Oct. 17, 2014, 11 pages.
- Advisory Action dated Mar. 2, 2015, issued in connection with U.S. Appl. No. 13/848,932, filed Mar. 22, 2013, 3 pages.
- Advisory Action dated Jan. 5, 2012, issued in connection with U.S. Appl. No. 12/035,112, filed Feb. 21, 2008, 3 pages.
- Advisory Action dated Oct. 5, 2015, issued in connection with U.S. Appl. No. 13/458,558, filed Apr. 27, 2012, 4 pages.
- Advisory Action dated Sep. 5, 2014, issued in connection with U.S. Appl. No. 13/907,666, filed May 31, 2013, 3 pages.
- Advisory Action dated Oct. 6, 2016, issued in connection with U.S. Appl. No. 13/458,558, filed Apr. 27, 2012, 4 pages.
- Advisory Action dated Jan. 8, 2015, issued in connection with U.S. Appl. No. 13/705,176, filed Dec. 5, 2012, 4 pages.
- Advisory Action dated Jun. 9, 2016, issued in connection with U.S. Appl. No. 13/871,795, filed Apr. 25, 2013, 3 pages.
- Advisory Action dated Feb. 10, 2016, issued in connection with U.S. Appl. No. 13/871,795, filed Apr. 26, 2013, 3 pages.
- Advisory Action dated Nov. 12, 2014, issued in connection with U.S. Appl. No. 13/907,666, filed May 31, 2013, 6 pages.
- Advisory Action dated Apr. 15, 2015, issued in connection with U.S. Appl. No. 14/184,526, filed Feb. 19, 2014, 9 pages.
- Advisory Action dated Apr. 15, 2015, issued in connection with U.S. Appl. No. 14/184,935, filed Feb. 20, 2014, 9 pages.
- Advisory Action dated Dec. 22, 2011, issued in connection with U.S. Appl. No. 11/853,790, filed Sep. 11, 2007, 2 pages.
- Advisory Action dated Mar. 25, 2015, issued in connection with U.S. Appl. No. 13/533,105, filed Jun. 26, 2012, 5 pages.
- Advisory Action dated Feb. 26, 2015, issued in connection with U.S. Appl. No. 14/184,528, filed Feb. 19, 2014, 3 pages.
- Advisory Action dated Nov. 26, 2014, issued in connection with U.S. Appl. No. 14/186,850, filed Feb. 21, 2014, 9 pages.
- Advisory Action dated Jul. 28, 2015, issued in connection with U.S. Appl. No. 14/184,522, filed Feb. 19, 2014, 7 pages.
- Advisory Action dated Sep. 28, 2009, issued in connection with U.S. Appl. No. 10/816,217, filed Apr. 1, 2004, 4 pages.
- Agere Systems’ Voice-over-Wireless LAN (VoWLAN) Station Quality of Service, AVAGO0015, Agere Systems, Jan. 2005, 5 pages.
- Akyildiz et al., “Multimedia Group Synchronization Protocols for Integrated Services Networks,” IEEE Journal on Selected Areas in Communications, 1996 pp. 162-173, vol. 14, No. 1.
- Anonymous, “Information technology—Generic coding of moving pictures and associated audio information—Part 3: Audio,” ISO/IEC 13818-3, Apr. 1998, pp. 11.
- Anonymous, “Transmission Control Protocol,” RFC: 793, USC/Information Sciences Institute, Sep. 1981, 91 pages.
- Audio Authority: How to Install and Use the Model 1154 Signal Sensing Auto Selector, 2002, 4 pages.
- Audio Authority: Model 1154B High Definition AV Auto Selector, 2008, 8 pages.
- AudioSource: AMP 100 User Manual, 2003, 4 pages.
- AudioTron Quick Start Guide, Version 1.0, Mar. 2001, 24 pages.
- AudioTron Reference Manual, Version 3.0, May 2002, 70 pages.
- AudioTron Setup Guide, Version 3.0, May 2002, 38 pages.
- Automatic Profile Hunting Functional Description, AVAGO0013, Agere Systems, Feb. 2004, 2 pages.
- “A/V Surround Receiver AVR-5800,” Denon Electronics, 2000, 2 pages.
- “A/V System Controleer, Owner’s Manual,” B&K Compontents, Ltd., 1998, 52 pages.
- AVTransport:1 Service Template Version 1.01 for UPnP, Version 1.0 (Jun. 25, 2002) (66 pages).
- AXIS Communication: AXIS P8221 Network I/O Audio Module, 2009, 41 pages.
- Baldwin, Roberto. “How-To: Setup iTunes DJ on Your Max and iPhone”, available at http://www.maclife.com/article/howtos/howto_setup_itunes_dj_your_mac_and_iphone, archived on Mar. 3, 2009, 4 pages.
- Balfanz et al., “Network-in-a-Box: How to Set Up a Secure Wireless Network in Under a Minute,” 13th USENIX Security Symposium—Technical Paper, 2002, 23 pages.

US 10,469,966 B2

Page 18

(56)

References Cited

OTHER PUBLICATIONS

- Balfanz et al., "Talking to Strangers: Authentication in Ad-Hoc Wireless Networks," Xerox Palo Alto Research Center, 2002, 13 pages.
- Barham et al., "Wide Area Audio Synchronisation," University of Cambridge Computer Laboratory, 1995, 5 pages.
- Baudisch et al., "Flat Volume Control: Improving Usability by Hiding the Volume Control Hierarchy in the User Interface," 2004, 8 pages.
- Benslimane Abderrahim, "A Multimedia Synchronization Protocol for Multicast Groups," Proceedings of the 26th Euromicro Conference, 2000, pp. 456-463, vol. 1.
- Biersack et al., "Intra- and Inter-Stream Synchronization for Stored Multimedia Streams," IEEE International Conference on Multimedia Computing and Systems, 1996, pp. 372-381.
- Blakowski G. et al., "A Media Synchronization Survey: Reference Model, Specification, and Case Studies," Jan. 1996, pp. 5-35, vol. 14, No. 1.
- Bluetooth. "Specification of the Bluetooth System: The ad hoc SCATTERNET for affordable and highly functional wireless connectivity," Core, Version 1.0 A, Jul. 26, 1999, 1068 pages.
- Bluetooth. "Specification of the Bluetooth System: Wireless connections made easy," Core, Version 1.0 B, Dec. 1, 1999, 1076 pages.
- Bogen Communications, Inc., ProMatrix Digitally Matrixed Amplifier Model PM3180, Copyright 1996, 2 pages.
- Brassil et al., "Enhancing Internet Streaming Media with Cueing Protocols," 2000, 9 pages.
- Breebaart et al., "Multi-Channel Goes Mobile: MPEG Surround Binaural Rendering," AES 29th International Conference, Sep. 2-4, 2006, pp. 1-13.
- Bretl W.E., et al., MPEG2 Tutorial [online], 2000 [retrieved on Jan. 13, 2009] Retrieved from the Internet: (<http://www.bretl.com/mpeghtml/MPEGIndex.htm>), pp. 1-23.
- Buerk et al., "AVTransport:1 Service Template Version 1.01," Contributing Members of the UPnP Forum, Jun. 25, 2002, 67 pages.
- Canadian Intellectual Property Office, Canadian Office Action dated Apr. 4, 2016, issued in connection with Canadian Patent Application No. 2,842,342, 5 pages.
- Canadian Intellectual Property Office, Canadian Office Action dated Sep. 14, 2015, issued in connection with Canadian Patent Application No. 2,842,342, 2 pages.
- Canadian Patent Office, Canadian Office Action dated Aug. 30, 2017, issued in connection with CA Application No. 2947275, 5 pages.
- Canadian Patent Office, Office Action dated Apr. 10, 2015, issued in connection with Canadian Patent Application No. 2,832,542, 3 pages.
- Cen et al., "A Distributed Real-Time MPEG Video Audio Player," Department of Computer Science and Engineering, Oregon Graduate Institute of Science and Technology, 1995, 12 pages.
- Chakrabarti et al., "A Remotely Controlled Bluetooth Enabled Environment," IEEE, 2004, pp. 77-81.
- Change Notification: Agere Systems WaveLan Multimode Reference Design (D2 to D3), AVAGO0042, Agere Systems, Nov. 2004, 2 pages.
- Chinese Patent Office, First Office Action dated Oct. 12, 2018, issued in connection with Chinese Application No. 201610804134.8, 10 pages.
- Chinese Patent Office, Office Action dated Jul. 5, 2016, issued in connection with Chinese Patent Application No. 201380044380.2, 25 pages.
- Chinese Patent Office, Office Action dated Nov. 27, 2015, issued in connection with Chinese Patent Application No. 201280028038.9, 26 pages.
- Connection Manager: 1 Service Template Version 1.01 for UPnP, Version 1.0 (Jun. 25, 2002) (25 pages).
- ContentDirectory:1 Service Template Version 1.01 for UPnP, Version 1.0 (Jun. 25, 2002) (89 pages).
- Corrected Notice of Allowance dated Mar. 12, 2015, issued in connection with U.S. Appl. No. 13/630,565, filed Sep. 28, 2012, 4 pages.
- Corrected Notice of Allowance dated Aug. 19, 2015, issued in connection with U.S. Appl. No. 13/907,666, filed May 31, 2013, 2 pages.
- Corrected Notice of Allowance dated Oct. 30, 2015, issued in connection with U.S. Appl. No. 13/013,740, filed Jan. 25, 2011, 2 pages.
- Corrected Notice of Allowance dated Dec. 6, 2017, issued in connection with U.S. Appl. No. 15/228,685, filed Aug. 4, 2016, 5 pages.
- Creative, "Connecting Bluetooth Devices with Creative D200," <http://support.creative.com/kb/ShowArticle.aspx?url=http://ask.creative.com:80/SRVS/CGI-BIN/WEBCGI.EXE/?St=106,E=000000000396859016,K=9377,Sxi=8,VARSET=ws:http://us.creative.com.case=63350>, available on Nov. 28, 2011, 2 pages.
- Crown PIP Manual available for sale at least 2004, 68 pages.
- Dannenberg et al., "A. System Supporting Flexible Distributed Real-Time Music Processing," Proceedings of the 2001 International Computer Music Conference, 2001, 4 pages.
- Dannenberg, Roger B., "Remote Access to Interactive Media," Proceedings of the SPIE 1785, 1993, pp. 230-237.
- Day, Rebecca, "Going Elan!" Primedia Inc., 2003, 4 pages.
- Deep-Sleep Implementation in WL60011 for IEEE 802.11b Applications, AVAGO0020, Agere Systems, Jul. 2004, 22 pages.
- Dell, Inc. "Dell Digital Audio Receiver: Reference Guide," Jun. 2000, 70 pages.
- Dell, Inc. "Start Here," Jun. 2000, 2 pages.
- "Denon 2003-2004 Product Catalog," Denon, 2003-2004, 44 pages.
- Denon AV Surround Receiver AVR-1604/684 User's Manual, 2004, 128 pages.
- Denon AV Surround Receiver AVR-5800 Operating Instructions, Copyright 2000, 67 pages.
- Designing a UPnP AV MediaServer, Nelson Kidd (2003) (SONDM000115062-116) (55 pages).
- Dorwaldt, Carl, "EASE 4.1 Tutorial," Renkus-Heinz, Inc., 2004, 417 pages.
- "DP-0206 Digital Signal Processor," TOA Electronics, Inc., 2001, pp. 1-12.
- Dynaudio Acoustics Air Series, <http://www.soundonsound.com/sos/sep02/articles/dynaudioair.asp>, 2002, 4 pages.
- European Patent Office, European Extended Search Report dated Mar. 7, 2016, issued in connection with EP Application No. 13810340.3, 9 pages.
- European Patent Office, European Extended Search Report dated Feb. 28, 2014, issued in connection with EP Application No. 13184747.7, 8 pages.
- European Patent Office, European Extended Search Report dated Mar. 31, 2015, issued in connection with EP Application No. 14181454.1, 9 pages.
- European Patent Office, European Search Report dated Jul. 5, 2016, issued in connection with European Patent Application No. 16156935.5, 9 pages.
- European Patent Office, Examination Report dated Mar. 22, 2016, issued in connection with European Patent Application No. EP14181454.1, 6 pages.
- European Patent Office, Examination Report dated Oct. 24, 2016, issued in connection with European Patent Application No. 13808623.6, 4 pages.
- European Patent Office, Extended European Search Report dated Jul. 5, 2016, issued in connection with European Patent Application No. 16156940.5, 7 pages.
- Falcone, John, "Sonos BU150 Digital Music System review," CNET, CNET [online] Jul. 27, 2009 [retrieved on Mar. 16, 2016], 11 pages Retrieved from the Internet: URL:<http://www.cnet.com/products/sonos-bu150-digital-music-system/>.
- Faller, Christof, "Coding of Spatial Audio Compatible with Different Playback Formats," Audio Engineering Society Convention Paper (Presented at the 117th Convention), Oct. 28-31, 2004, 12 pages.
- File History of Re-Examination Application No. 90/013,423.

US 10,469,966 B2

Page 19

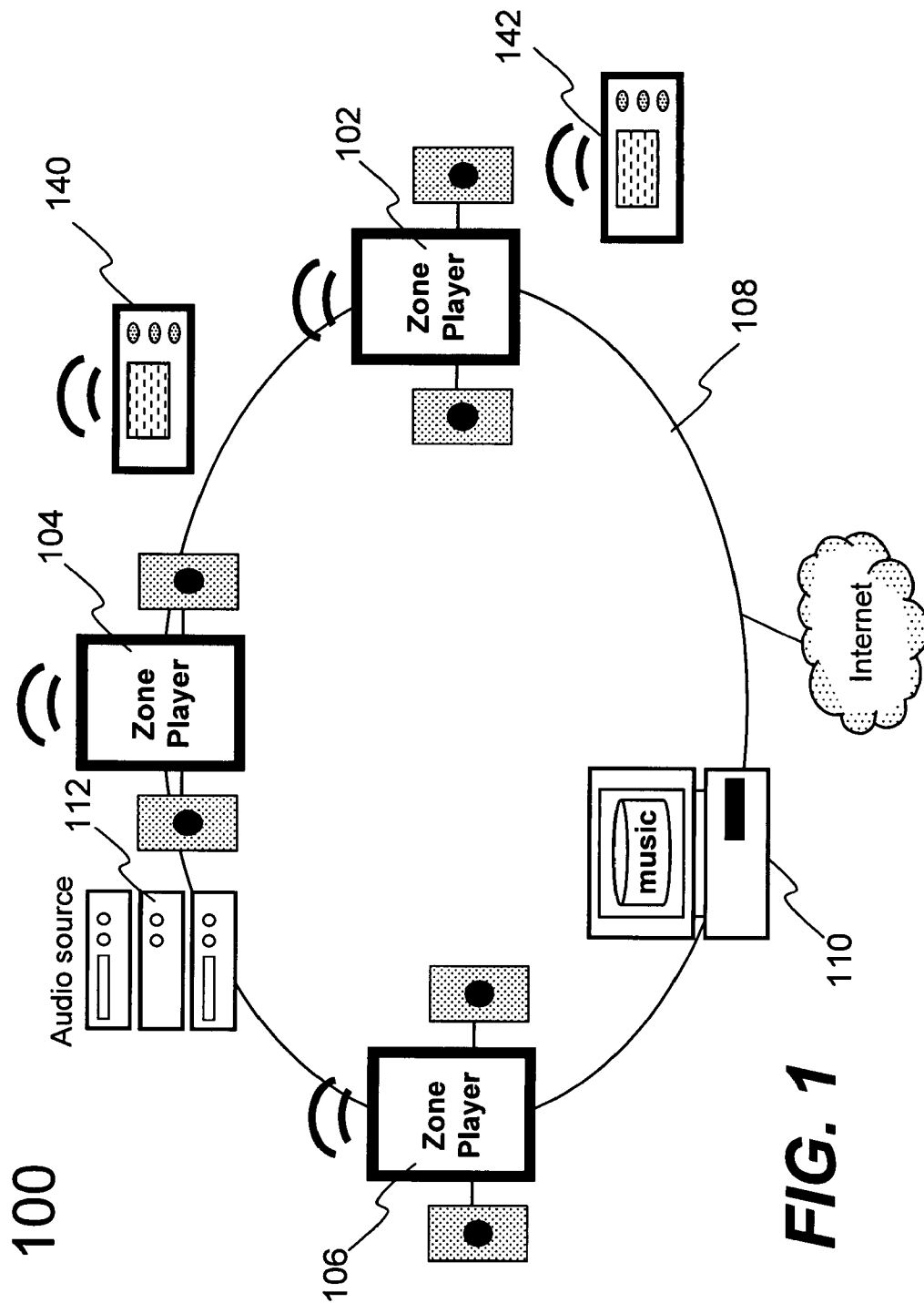
(56)

References Cited

OTHER PUBLICATIONS

Final Office Action dated Jun. 5, 2014, issued in connection with U.S. Appl. No. 13/907,666, filed May 31, 2013, 12 pages.
Final Office Action dated Jul. 13, 2009, issued in connection with U.S. Appl. No. 10/816,217, filed Apr. 1, 2004, 16 pages.
Final Office Action dated Sep. 13, 2012, issued in connection with U.S. Appl. No. 13/297,000, filed Nov. 15, 2011, 17 pages.
Final Office Action dated Nov. 18, 2015, issued in connection with U.S. Appl. No. 13/533,105, filed Jun. 26, 2012, 56 pages.
Final Office Action dated Oct. 21, 2011, issued in connection with U.S. Appl. No. 10/816,217, filed Apr. 1, 2004, 19 pages.
Final Office Action dated Jul. 23, 2014, issued in connection with U.S. Appl. No. 13/896,037, filed May 16, 2013, 12 pages.
AuviTran AVB32-ES User's Manual, 2005, 25 pages.
AuviTran AVKIT-ES for AD8HR User's Manual, 2005, 15 pages.
CobraNet Manager, Direct control over your audio network. www.peakaudio.com/CobraNet/FAQ.html, 2005 [retrieved online Jul. 12, 2019 at web.archive.org/web/20050403214230/http://www.peakaudio.com/CobraNet/FAQ] 13 pages.
Non-Final Office Action dated Jul. 17, 2019, issued in connection with U.S. Appl. No. 15/130,919, filed Apr. 15, 2016, 15 pages.
Non-Final Office Action dated Aug. 28, 2019, issued in connection with U.S. Appl. No. 16/422,160, filed May 24, 2019, 14 pages.
Non-Final Office Action dated Jul. 5, 2019, issued in connection with U.S. Appl. No. 16/383,561, filed Apr. 12, 2019, 12 pages.

* cited by examiner



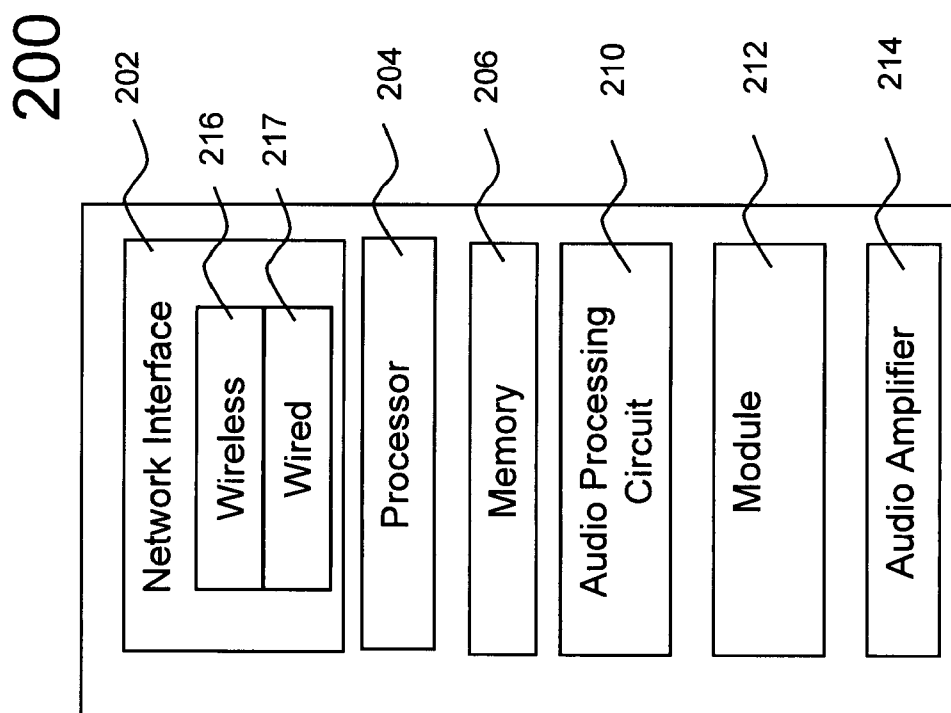


FIG. 2A

240

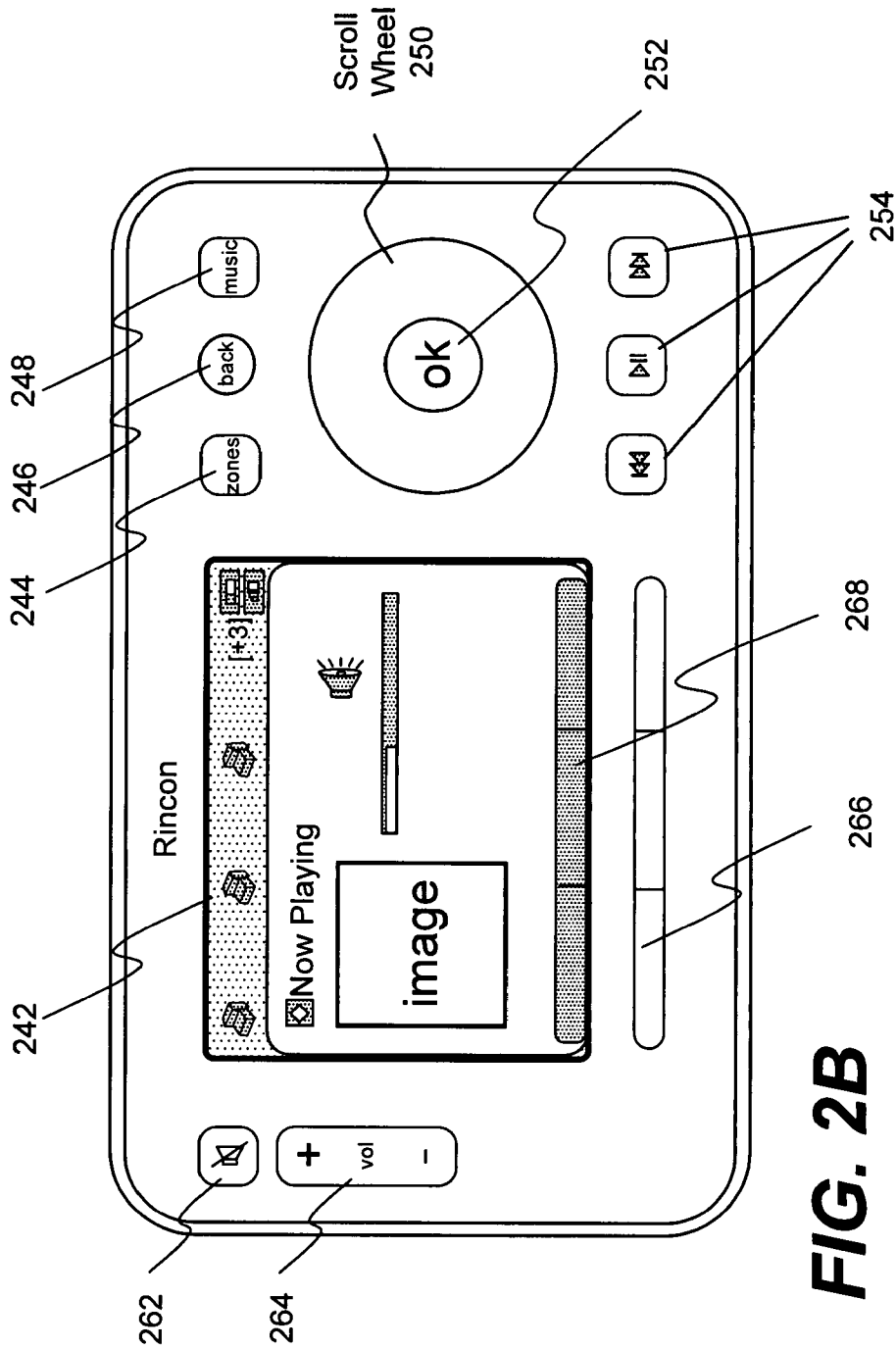


FIG. 2B

270

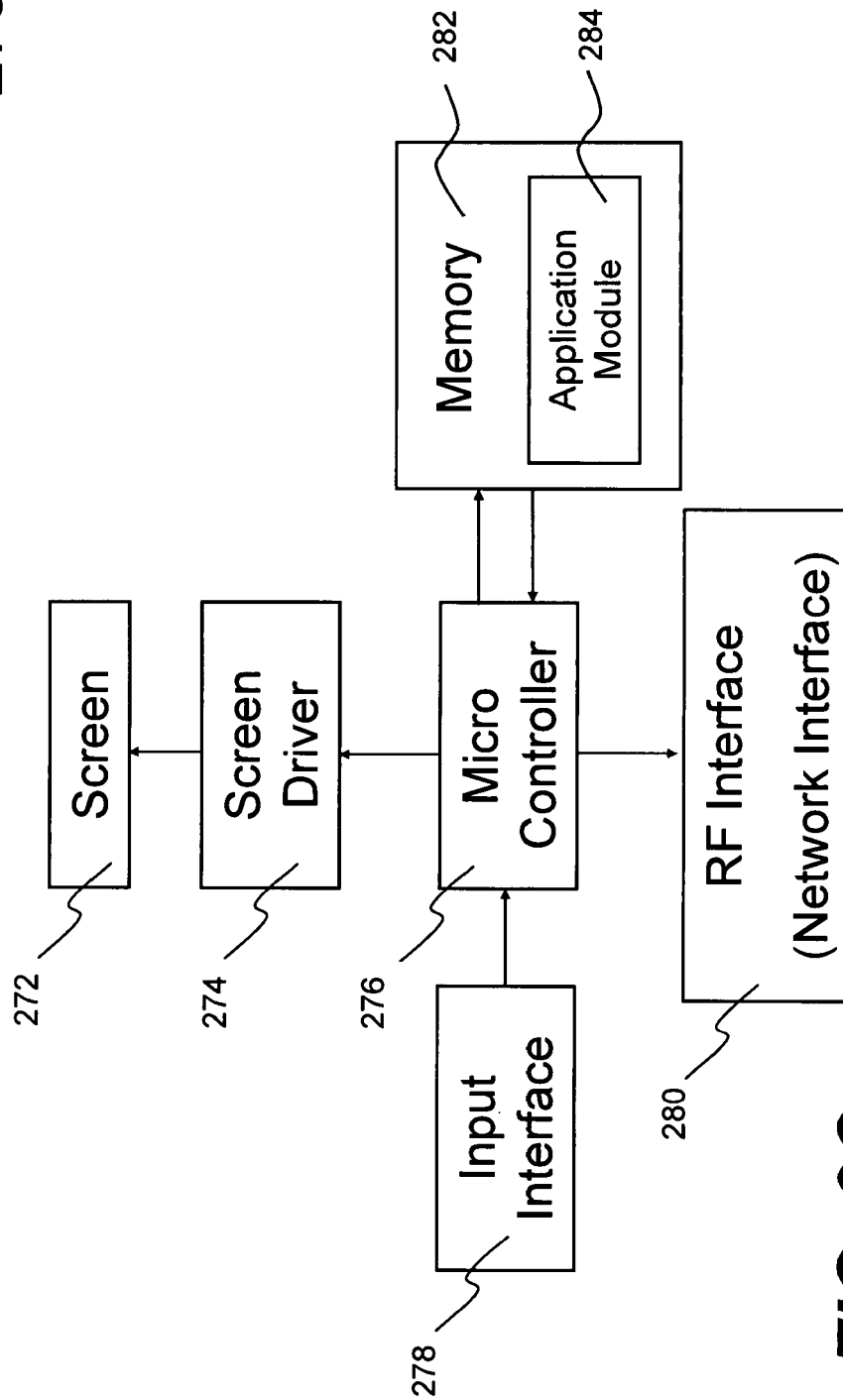


FIG. 2C

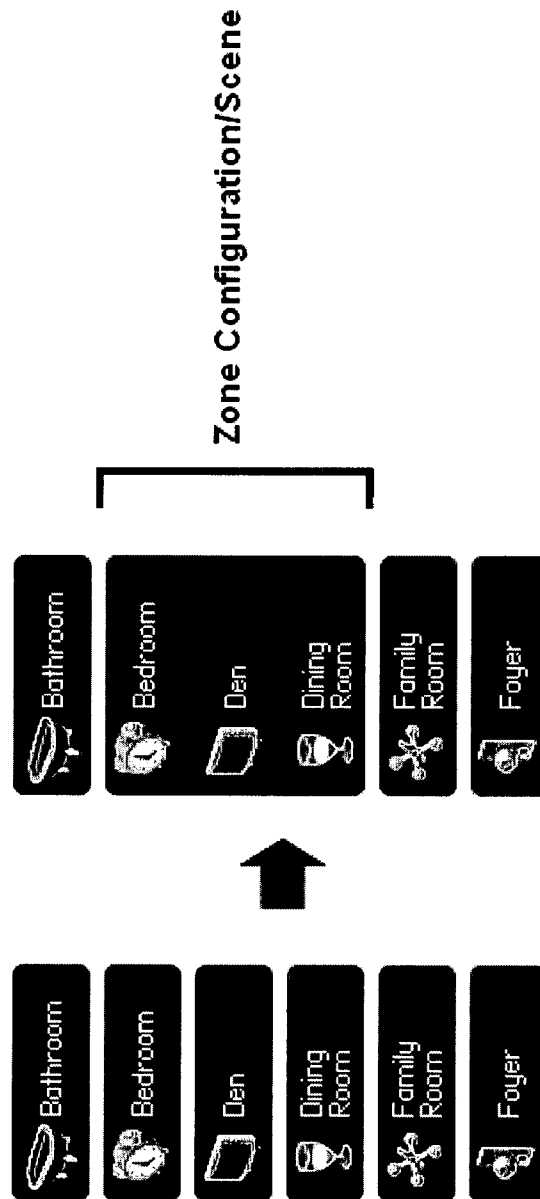


FIG. 3A

U.S. Patent

Nov. 5, 2019

Sheet 6 of 13

US 10,469,966 B2

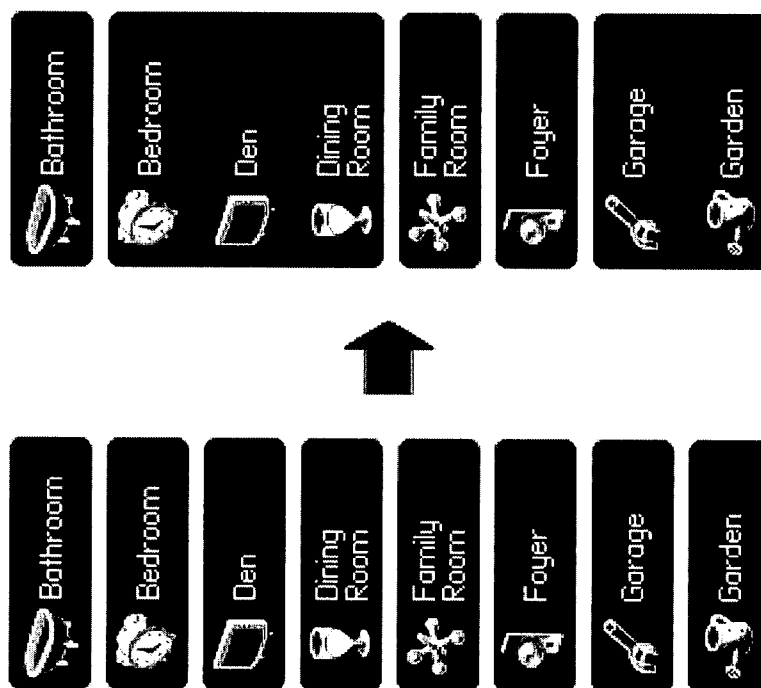
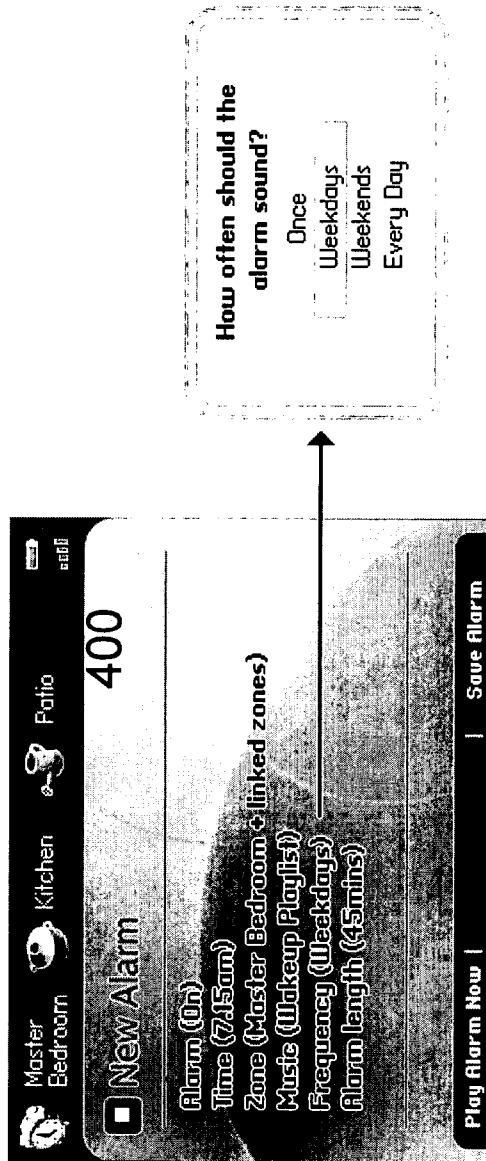
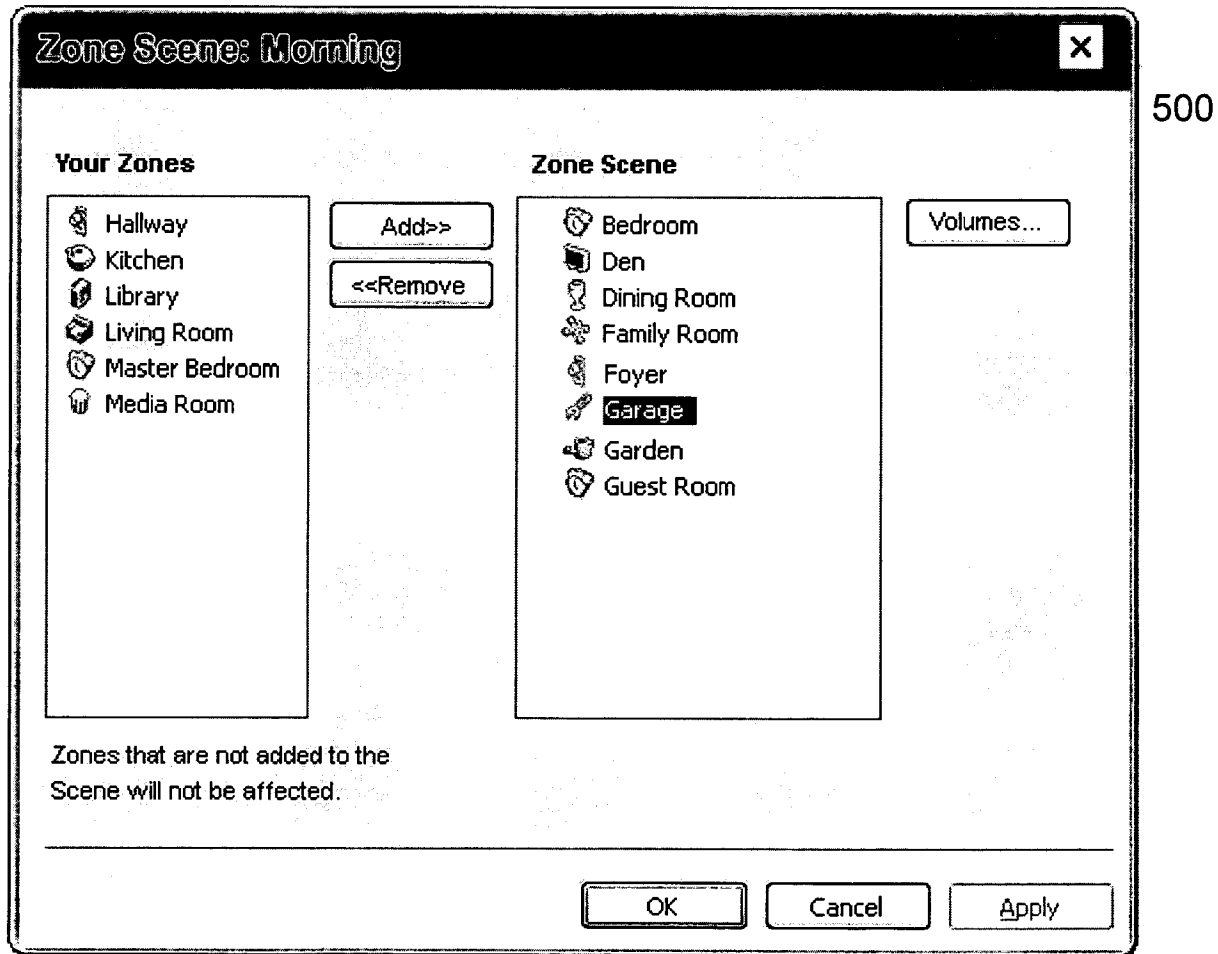


FIG. 3B



**FIG. 5A**

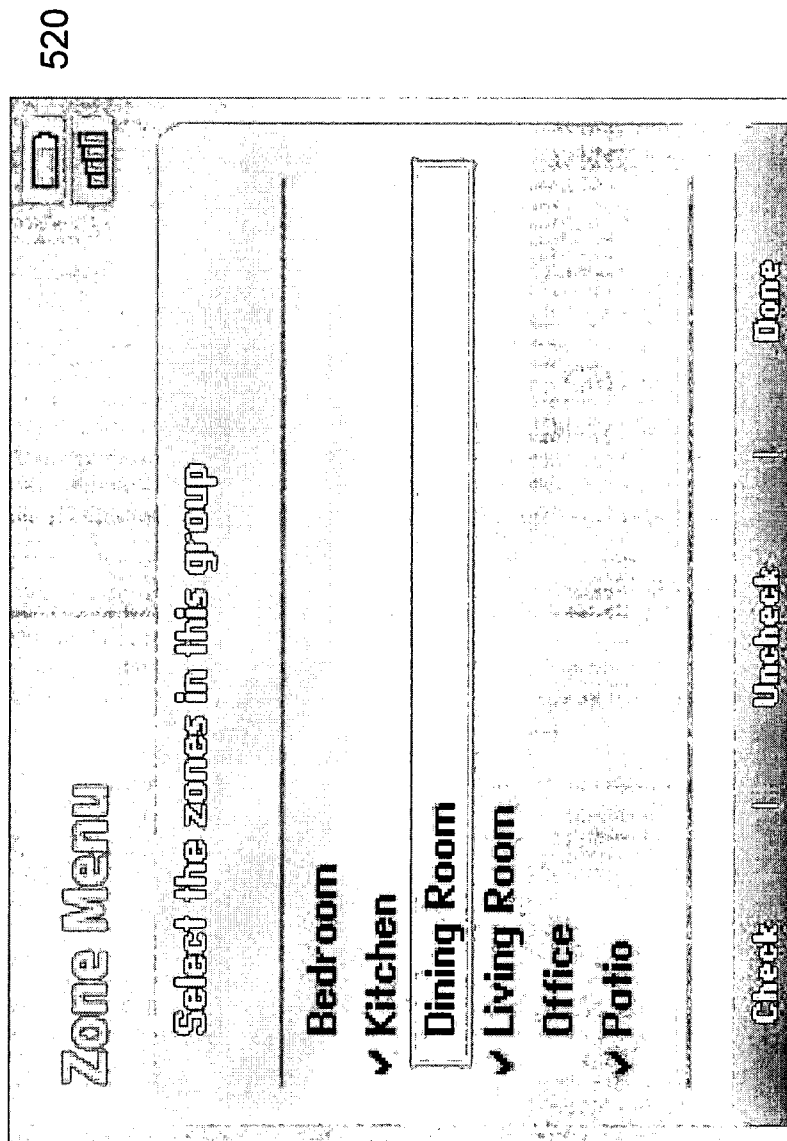
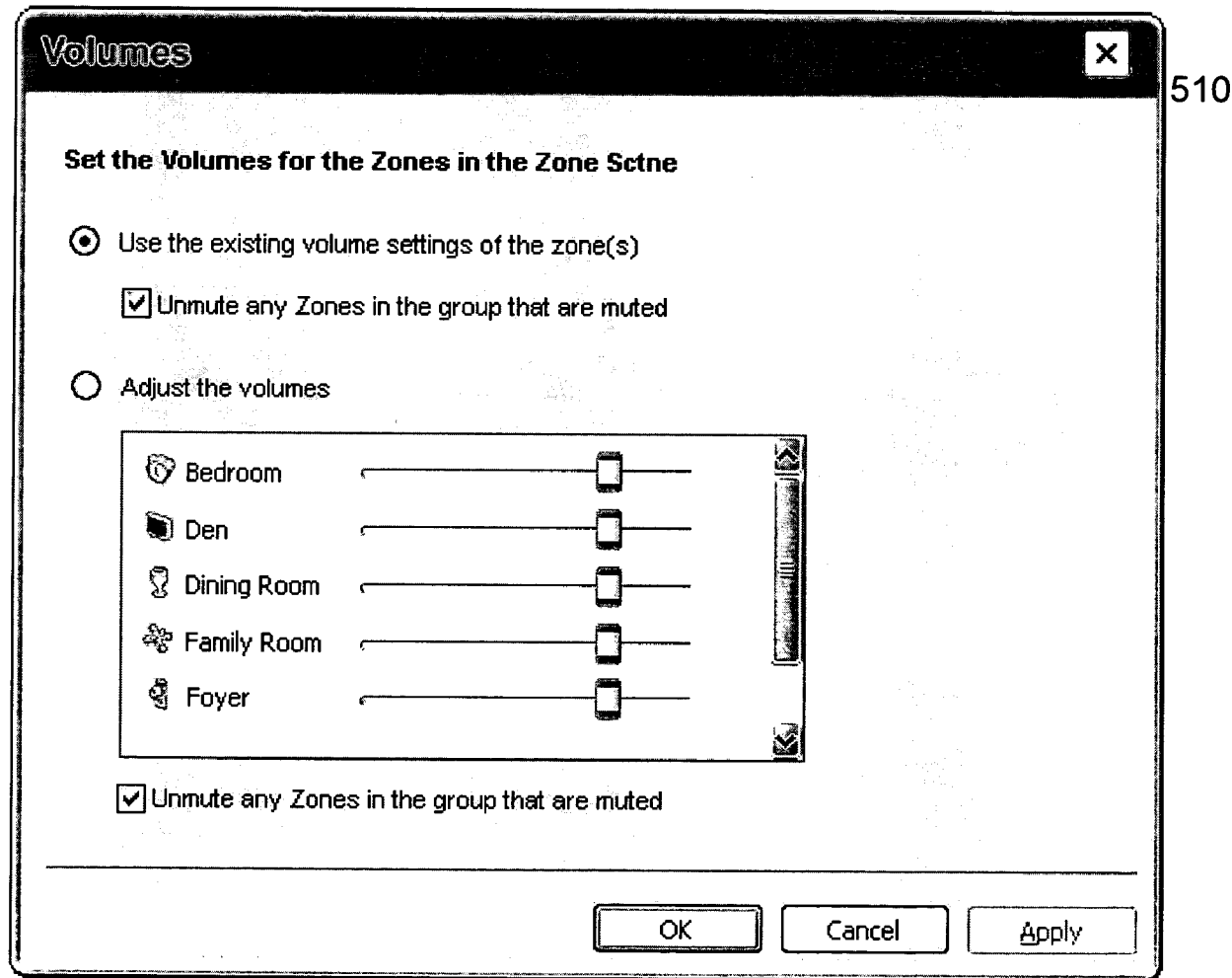
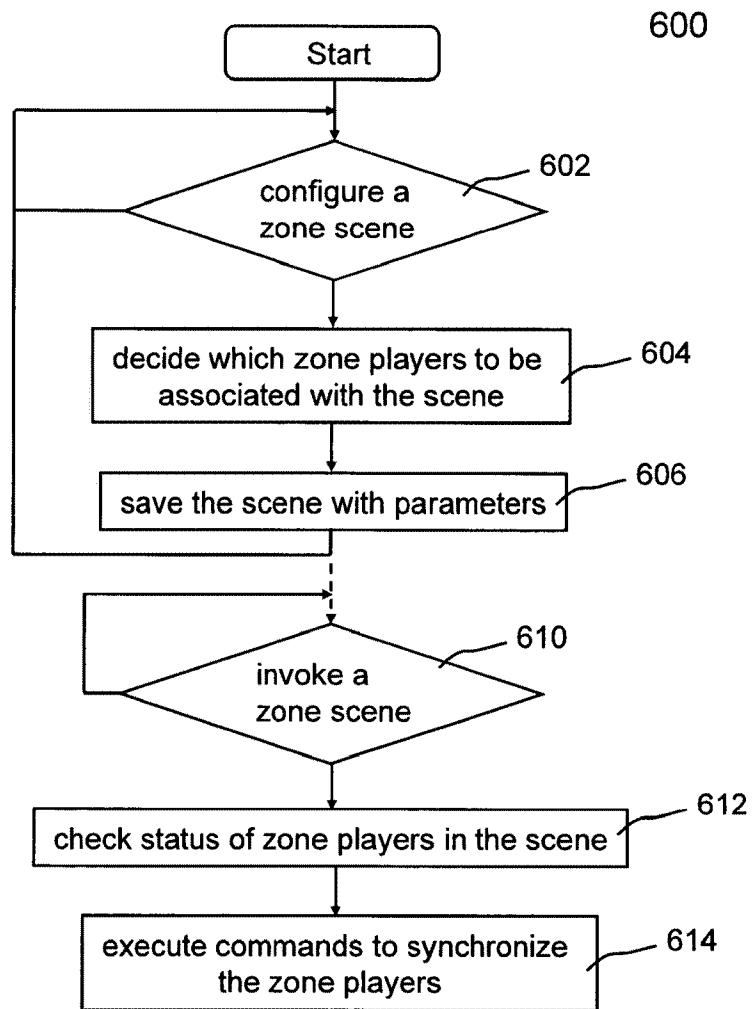


FIG. 5B

**FIG. 5C**

**FIG. 6**

U.S. Patent

Nov. 5, 2019

Sheet 12 of 13

US 10,469,966 B2

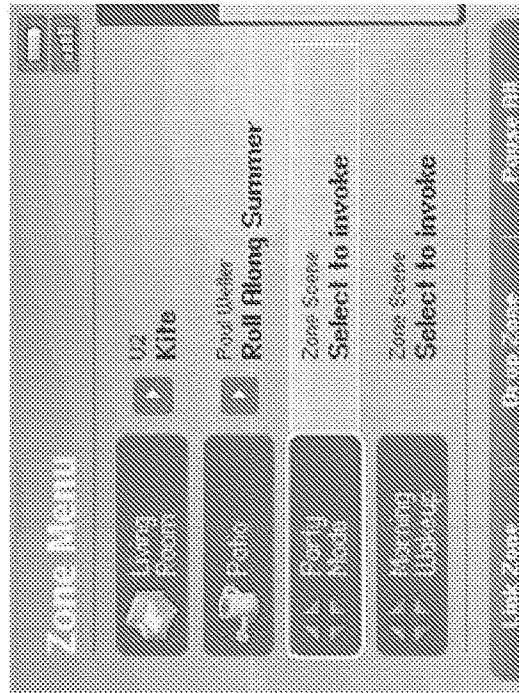


FIG. 7

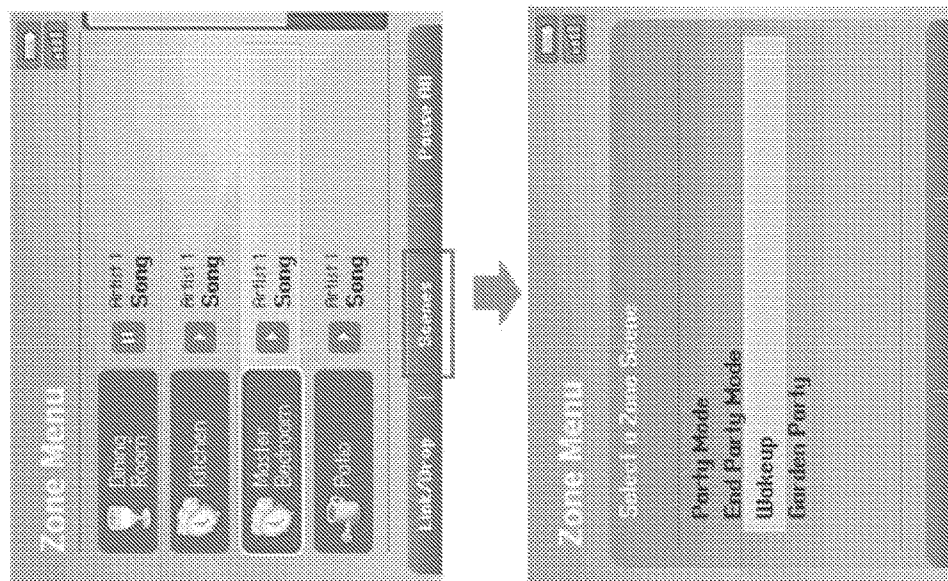


FIG. 8

US 10,469,966 B2

1

ZONE SCENE MANAGEMENT**CROSS REFERENCE TO RELATED APPLICATIONS**

This application is a continuation of and claims priority to U.S. patent application Ser. No. 15/130,919, filed on Apr. 15, 2016, entitled "ZONE SCENE ACTIVATION," which is a continuation of U.S. patent application Ser. No. 14/465,457, filed on Aug. 21, 2014, entitled "METHOD AND APPARATUS FOR UPDATING ZONE CONFIGURATIONS IN A MULTI-ZONE SYSTEM," which is a continuation of U.S. patent application Ser. No. 13/896,829, filed on May 17, 2013, entitled "METHOD AND APPARATUS FOR UPDATING ZONE CONFIGURATIONS IN A MULTI-ZONE SYSTEM," which is a continuation of U.S. patent application Ser. No. 11/853,790, filed Sep. 11, 2007, entitled "CONTROLLING AND MANIPULATING GROUPINGS IN A MULTI-ZONE MEDIA SYSTEM," which claims priority to U.S. Provisional Application No. 60/825,407 filed on Sep. 12, 2006, entitled "CONTROLLING AND MANIPULATING GROUPINGS IN A MULTI-ZONE MEDIA SYSTEM," each of which is hereby incorporated by reference in its entirety for all purposes.

BACKGROUND OF THE INVENTION**Field of the Invention**

The invention is generally related to the area of consumer electronics and human-computer interaction. In particular, the invention is related to method and apparatus for controlling or manipulating a plurality of multimedia players in a multi-zone system.

An enduring passion for quality audio reproduction or system is continuing to drive demands from users. One of the demands includes an audio system in a house in which, for example, one could grill to classic rock on a patio while another one may cook up his/her own music selections in a kitchen. This is all at the same time while a teenager catches a ballgame in a family room, and another one blasts pop in a bedroom. And the best part of such audio system is that each family member does not need his or her own stereo system—one system gives everyone access to all the music sources.

Currently, one of the systems that can meet part of such demand is a conventional multi-zone audio system that usually includes a number of audio players. Each of the audio players has its own amplifier(s) and a set of speakers and typically installed in one place (e.g., a room). In order to play an audio source at one location, the audio source must be provided locally or from a centralized location. When the audio source is provided locally, the multi-zone audio system functions as a collection of many stereo systems, making source sharing difficult. When the audio source is provided centrally, the centralized location may include a juke box, many compact discs, an AM or FM radio, tapes, or others. To send an audio source to an audio player demanding such source, a cross-bar type of device is used to prevent the audio source from going to other audio players that may be playing other audio sources.

In order to achieve playing different audio sources in different audio players, the traditional multi-zone audio system is generally either hard-wired or controlled by a pre-configured and pre-programmed controller. While the pre-programmed configuration may be satisfactory in one situation, it may not be suitable for another situation. For

2

example, a person would like to listen to broadcast news from his/her favorite radio station in a bedroom, a bathroom and a den while preparing to go to work in the morning. The same person may wish to listen in the den and the living room to music from a compact disc in the evening. In order to satisfy such requirements, two groups of audio players must be established. In the morning, the audio players in the bedroom, the bathroom and the den need to be grouped for the broadcast news. In the evening, the audio players in the den and the living room are grouped for the music. Over the weekend, the audio players in the den, the living room, and a kitchen are grouped for party music. Because the morning group, the evening group and the weekend group contain the den, it can be difficult for the traditional system to accommodate the requirement of dynamically managing the ad hoc creation and deletion of groups.

There is a need for dynamic control of the audio players as a group. With a minimum manipulation, the audio players may be readily grouped. In a traditional multi-zone audio system, the audio players have to be adjusted one at a time, resulting in an inconvenient and non-homogenous audio environment. Further, there is a need to individually or systematically adjust the audio volume of the audio players.

SUMMARY OF THE INVENTION

This section is for the purpose of summarizing some aspects of the present invention and to briefly introduce some preferred embodiments. Simplifications or omissions in this section as well as in the abstract or the title of this description may be made to avoid obscuring the purpose of this section, the abstract and the title. Such simplifications or omissions are not intended to limit the scope of the present invention.

In general, the present invention pertains to controlling a plurality of multimedia players, or simply players, in groups. According to one aspect of the present invention, a mechanism is provided to allow a user to group some of the players according to a theme or scene, where each of the players is located in a zone. When the scene is activated, the players in the scene react in a synchronized manner. For example, the players in the scene are all caused to play an audio source or music in a playlist, wherein the audio source may be located anywhere on a network.

According to another aspect of the present invention, the scene may be activated at any time or a specific time. A user may activate the scene at any time so that only some selected zones in an entertainment system facilitate a playback of an audio source. When the scene is activated at a specific time, the scene may be used as an alarm or buzzer.

According to still another aspect of the present invention, a controlling device (also referred to herein as controller) is provided to facilitate a user to select any of the players in the system to form respective groups each of which is set up per a scene. Although various scenes may be saved in any of the members in a group, commands are preferably sent from the controller to the rest of the members when one of the scenes is executed. Depending on implementation, the commands include parameters pertaining to identifiers of the players, volumes settings, audio source and etc.

According to yet another aspect of the present invention, a configurable module is implemented in the controlling device that provides interactive graphic user interface for forming, managing and controlling groups in the system, de-grouping a group or adjusting audio volume of individual players or a group of players.

US 10,469,966 B2

3

The present invention may be implemented in many forms including software, hardware or a combination of both. According to one embodiment, the present invention is directed to a method for groupings in a multi-zone media system, the method comprises providing a mechanism to allow a user to determine which players in the system to be associated with a theme representing a group; and configuring the theme with parameters pertaining to the players, wherein the theme is activated at anytime or a specific time so that the players react in a synchronized manner. The players in a scene are synchronized to play a multimedia file when the scene is activated.

According to another embodiment, the present invention is directed to an entertainment system for grouping players, the system comprises: a plurality of players, each located in one zone; and a controller providing a mechanism to allow a user to select which of the players to be associated with a theme representing a group; and configure the theme with parameters pertaining to the selected players, wherein the theme is activated at anytime or a specific time so that the selected players react in a synchronized manner. As a result, the selected players are synchronized to play a multimedia that is in a digital format and retrieved from a source over a network.

One of the objects, features, and advantages of the present invention is to remotely control a plurality of multimedia players in a multi-zone system, playing and controlling the audio source synchronously if the players are grouped together, or playing and controlling the audio source individually if the players are disassociated with each other.

Other objects, features, and advantages of the present invention will become apparent upon examining the following detailed description of an embodiment thereof, taken in conjunction with the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other features, aspects, and advantages of the present invention will become better understood with regard to the following description, appended claims, and accompanying drawings where:

FIG. 1 shows an exemplary configuration in which the present invention may be practiced;

FIG. 2A shows an exemplary functional block diagram of a player in accordance with the present invention;

FIG. 2B shows an example of a controller that may be used to remotely control one of more players of FIG. 2A;

FIG. 2C shows an exemplary internal functional block diagram of a controller in accordance with one embodiment of the present invention;

FIG. 3A provides an illustration of one zone scene, where the left column shows the starting zone grouping—all zones are separate, the column on the right shows the effects of grouping the zones to make a group of 3 zones named after “Morning”;

FIG. 3B shows that a user defines multiple groups to be gathered at the same time;

FIG. 4 shows an exemplary user interface that may be displayed on a controller or a computer of FIG. 1;

FIG. 5A shows a user interface to allow a user to form a scene;

FIG. 5B shows another user interface 520 to allow a user to form a scene;

FIG. 5C shows a user interface to allow a user to adjust a volume level of the zone players in a zone scene individually or collectively;

4

FIG. 6 shows a flowchart or process of providing a player theme or a zone scene for a plurality of players, where one or more of the players are placed in a zone; and

FIG. 7 shows an example user interface for invoking a zone scene; and

FIG. 8 shows another example user interface for invoking a zone scene.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The detailed description of the invention is presented largely in terms of procedures in terms of procedures, steps, logic blocks, processing, and other symbolic representations that directly or indirectly resemble the operations of data processing devices coupled to networks. These process descriptions and representations are typically used by those skilled in the art to most effectively convey the substance of their work to others skilled in the art. Numerous specific details are set forth in order to provide a thorough understanding of the present invention. However, it will become obvious to those skilled in the art that the present invention may be practiced without these specific details. In other instances, well known methods, procedures, components, and circuitry have not been described in detail to avoid unnecessarily obscuring aspects of the present invention.

Reference herein to “one embodiment” or “an embodiment” means that a particular feature, structure, or characteristic described in connection with the embodiment can be included in at least one embodiment of the invention. The appearances of the phrase “in one embodiment” in various places in the specification are not necessarily all referring to the same embodiment, nor are separate or alternative embodiments mutually exclusive of other embodiments. Further, the order of blocks in process flowcharts or diagrams representing one or more embodiments of the invention do not inherently indicate any particular order nor imply any limitations in the invention.

Referring now to the drawings, in which like numerals refer to like parts throughout the several views. FIG. 1 shows an exemplary configuration 100 in which the present invention may be practiced. The configuration may represent, but not be limited to, a part of a residential home, a business building or a complex with multiple zones. There are a number of multimedia players of which three examples 102, 104 and 106 are shown as audio devices. Each of the audio devices may be installed or provided in one particular area or zone and hence referred to as a zone player herein.

As used herein, unless explicitly stated otherwise, an audio source or audio sources are in digital format and can be transported or streamed over a data network. To facilitate the understanding of the present invention, it is assumed that the configuration 100 represents a home. Thus, the zone player 102 and 104 may be located in two of the bedrooms respectively while the zone player 106 may be installed in a living room. All of the zone players 102, 104 and 106 are coupled directly or indirectly to a data network 108. In addition, a computing device 110 is shown to be coupled on the network 108. In reality, any other devices such as a home gateway device, a storage device, or an MP3 player may be coupled to the network 108 as well.

The network 108 may be a wired network, a wireless network or a combination of both. In one example, all devices including the zone players 102, 104 and 106 are coupled to the network 108 by wireless means based on an industry standard such as IEEE 802.11. In yet another example, all devices including the zone players 102, 104 and

US 10,469,966 B2

5

106 are part of a local area network that communicates with a wide area network (e.g., the Internet).

Many devices on the network **108** are configured to download and store audio sources. For example, the computing device **110** can download audio sources from the Internet and store the downloaded sources locally for sharing with other devices on the Internet or the network **108**. The computing device **110** or any of the zone players can also be configured to receive streaming audio. Shown as a stereo system, the device **112** is configured to receive an analog audio source (e.g., from broadcasting) or retrieve a digital audio source (e.g., from a compact disk). The analog audio sources can be converted to digital audio sources. In accordance with the present invention, the audio source may be shared among the devices on the network **108**.

Two or more zone players may be grouped together to form a new zone group. Any combinations of zone players and an existing zone group may be grouped together. In one instance, a new zone group is formed by adding one zone player to another zone player or an existing zone group.

Referring now to FIG. 2A, there is shown an exemplary functional block diagram of a zone player **200** in accordance with the present invention. The zone player **200** includes a network interface **202**, a processor **204**, a memory **206**, an audio processing circuit **210**, a module **212**, and optionally, an audio amplifier **214** that may be internal or external. The network interface **202** facilitates a data flow between a data network (i.e., the data network **108** of FIG. 1) and the zone player **200** and typically executes a special set of rules (i.e., a protocol) to send data back and forth. One of the common protocols used in the Internet is TCP/IP (Transmission Control Protocol/Internet Protocol). In general, a network interface manages the assembling of an audio source or file into smaller packets that are transmitted over the data network or reassembles received packets into the original source or file. In addition, the network interface **202** handles the address part of each packet so that it gets to the right destination or intercepts packets destined for the zone player **200**.

The network interface **202** may include one or both of a wireless interface **216** and a wired interface **217**. The wireless interface **216**, also referred to as a RF interface, provides network interface functions by a wireless means for the zone player **200** to communicate with other devices in accordance with a communication protocol (such as the wireless standard IEEE 802.11a, 802.11b or 802.11g). The wired interface **217** provides network interface functions by a wired means (e.g., an Ethernet cable). In one embodiment, a zone player includes both of the interfaces **216** and **217**, and other zone players include only a RF or wired interface. Thus these other zone players communicate with other devices on a network or retrieve audio sources via the zone player. The processor **204** is configured to control the operation of other parts in the zone player **200**. The memory **206** may be loaded with one or more software modules that can be executed by the processor **204** to achieve desired tasks. According to one aspect of the present invention, a software module implementing one embodiment of the present invention is executed, the processor **204** operates in accordance with the software module in reference to a saved zone group configuration characterizing a zone group created by a user, the zone player **200** is caused to retrieve an audio source from another zone player or a device on the network.

According to one embodiment of the present invention, the memory **206** is used to save one or more saved zone configuration files that may be retrieved for modification at

6

any time. Typically, a saved zone group configuration file is transmitted to a controller (e.g., the controlling device **140** or **142** of FIG. 1, a computer, a portable device, or a TV) when a user operates the controlling device. The zone group configuration provides an interactive user interface so that various manipulations or control of the zone players may be performed.

The audio processing circuit **210** resembles most of the circuitry in an audio playback device and includes one or more digital-to-analog converters (DAC), an audio preprocessing part, an audio enhancement part or a digital signal processor and others. In operation, when an audio source is retrieved via the network interface **202**, the audio source is processed in the audio processing circuit **210** to produce analog audio signals. The processed analog audio signals are then provided to the audio amplifier **214** for playback on speakers. In addition, the audio processing circuit **210** may include necessary circuitry to process analog signals as inputs to produce digital signals for sharing with other devices on a network.

Depending on an exact implementation, the module **212** may be implemented as a combination of hardware and software. In one embodiment, the module **212** is used to save a scene. The audio amplifier **214** is typically an analog circuit that powers the provided analog audio signals to drive one or more speakers.

Referring now to FIG. 2B, there is shown an exemplary controller **240**, which may correspond to the controlling device **140** or **142** of FIG. 1. The controller **240** may be used to facilitate the control of multi-media applications, automation and others in a complex. In particular, the controller **240** is configured to facilitate a selection of a plurality of audio sources available on the network, controlling operations of one or more zone players (e.g., the zone player **200**) through a RF interface corresponding to the RF interface **216** of FIG. 2A. According to one embodiment, the wireless means is based on an industry standard (e.g., infrared, radio, wireless standard IEEE 802.11a, 802.11b or 802.11g). When a particular audio source is being played in the zone player **200**, a picture, if there is any, associated with the audio source may be transmitted from the zone player **200** to the controller **240** for display. In one embodiment, the controller **240** is used to synchronize more than one zone players by grouping the zone players in a group. In another embodiment, the controller **240** is used to control the volume of each of the zone players in a zone group individually or together.

The user interface for the controller **240** includes a screen **242** (e.g., a LCD screen) and a set of functional buttons as follows: a "zones" button **244**, a "back" button **246**, a "music" button **248**, a scroll wheel **250**, "ok" button **252**, a set of transport control buttons **254**, a mute button **262**, a volume up/down button **264**, a set of soft buttons **266** corresponding to the labels **268** displayed on the screen **242**.

The screen **242** displays various screen menus in response to a user's selection. In one embodiment, the "zones" button **244** activates a zone management screen or "Zone Menu", which is described in more details below. The "back" button **246** may lead to different actions depending on the current screen. In one embodiment, the "back" button triggers the current screen display to go back to a previous one. In another embodiment, the "back" button negates the user's erroneous selection. The "music" button **248** activates a music menu, which allows the selection of an audio source (e.g., a song) to be added to a zone player's music queue for playback.

US 10,469,966 B2

7

The scroll wheel **250** is used for selecting an item within a list, whenever a list is presented on the screen **242**. When the items in the list are too many to be accommodated in one screen display, a scroll indicator such as a scroll bar or a scroll arrow is displayed beside the list. When the scroll indicator is displayed, a user may rotate the scroll wheel **250** to either choose a displayed item or display a hidden item in the list. The “ok” button **252** is used to confirm the user selection on the screen **242**.

There are three transport buttons **254**, which are used to control the effect of the currently playing song. For example, the functions of the transport buttons may include play/pause and forward/rewind a song, move forward to a next song track, or move backward to a previous track. According to one embodiment, pressing one of the volume control buttons such as the mute button **262** or the volume up/down button **264** activates a volume panel. In addition, there are three soft buttons **266** that can be activated in accordance with the labels **268** on the screen **242**. It can be understood that, in a multi-zone system, there may be multiple audio sources being played respectively in more than one zone players. The music transport functions described herein shall apply selectively to one of the sources when a corresponding one of the zone players or zone groups is selected.

FIG. 2C illustrates an internal functional block diagram of an exemplary controller **270**, which may correspond to the controller **240** of FIG. 2B. The screen **272** on the controller **270** may be a LCD screen. The screen **272** communicates with and is commanded by a screen driver **274** that is controlled by a microcontroller (e.g., a processor) **276**. The memory **282** may be loaded with one or more application modules **284** that can be executed by the microcontroller **276** with or without a user input via the user interface **278** to achieve desired tasks. In one embodiment, an application module is configured to facilitate grouping a number of selected zone players into a zone group and synchronizing the zone players for one audio source. In another embodiment, an application module is configured to control together the audio volumes of the zone players in a zone group. In operation, when the microcontroller **276** executes one of the application modules **284**, the screen driver **274** generates control signals to drive the screen **272** to display an application specific user interface accordingly, more of which will be described below.

The controller **270** includes a network interface **280** referred to as a RF interface **280** that facilitates wireless communication with a zone player via a corresponding RF interface thereof. In one embodiment, the commands such as volume control and audio playback synchronization are sent via the RF interfaces. In another embodiment, a saved zone group configuration is transmitted between a zone player and a controller via the RF interfaces. The controller **270** may control one or more zone players, such as **102**, **104** and **106** of FIG. 1. Nevertheless, there may be more than one controllers, each preferably in a zone (e.g., a room) and configured to control any one and all of the zone players.

In one embodiment, a user creates a zone group including at least two zone players from the controller **240** that sends signals or data to one of the zone players. As all the zone players are coupled on a network, the received signals in one zone player can cause other zone players in the group to be synchronized so that all the zone players in the group playback an identical audio source or a list of identical audio sources in a timely synchronized manner. Similarly, when a user increases the audio volume of the group from the controller, the signals or data of increasing the audio volume

8

for the group are sent to one of the zone players and causes other zone players in the group to be increased together in volume and in scale.

According to one implementation, an application module is loaded in memory **282** for zone group management. When a predetermined key (e.g. the “zones” button **244**) is activated on the controller **240**, the application module is executed in the microcontroller **276**. The input interface **278** coupled to and controlled by the microcontroller **276** receives inputs from a user. A “Zone Menu” is then displayed on the screen **272**. The user may start grouping zone players into a zone group by activating a “Link Zones” or “Add Zone” soft button, or de-grouping a zone group by activating an “Unlink Zones” or “Drop Zone” button. The detail of the zone group manipulation will be further discussed below.

As described above, the input interface **278** includes a number of function buttons as well as a screen graphical user interface. It should be pointed out that the controller **240** in FIG. 2B is not the only controlling device that may practice the present invention. Other devices that provide the equivalent control functions (e.g., a computing device, a hand-held device) may also be configured to practice the present invention. In the above description, unless otherwise specifically described, it is clear that keys or buttons are generally referred to as either the physical buttons or soft buttons, enabling a user to enter a command or data.

One mechanism for ‘joining’ zone players together for music playback is to link a number of zone players together to form a group. To link a number of zone players together, a user may manually link each zone player or room one after the other. For example, there is a multi-zone system that includes the following zones.

Bathroom
Bedroom
Den
Dining Room
Family Room
Foyer

If the user wishes to link **5** of the **6** zone players using the current mechanism, he/she must start with a single zone and then manually link each zone to that zone. This mechanism may be sometimes quite time consuming. According to one embodiment, a set of zones can be dynamically linked together using one command. Using what is referred to herein as a theme or a zone scene, zones can be configured in a particular scene (e.g., morning, afternoon, or garden), where a predefined zone grouping and setting of attributes for the grouping are automatically effectuated.

For instance, a “Morning” zone scene/configuration command would link the Bedroom, Den and Dining Room together in one action. Without this single command, the user would need to manually and individually link each zone. FIG. 3A provides an illustration of one zone scene, where the left column shows the starting zone grouping—all zones are separate, the column on the right shows the effects of grouping the zones to make a group of 3 zones named after “Morning”.

Expanding this idea further, a Zone Scene can be set to create multiple sets of linked zones. For example, a scene creates **3** separate groups of zones, the downstairs zones would be linked together, the upstairs zones would be linked together in their own group, and the outside zones (in this case the patio) would move into a group of its own.

US 10,469,966 B2

9

In one embodiment as shown in FIG. 3B, a user defines multiple groups to be gathered at the same time. For example: an “Evening Scene” is desired to link the following zones:

Group 1
Bedroom
Den
Dining Room
Group 2
Garage
Garden

where Bathroom, Family Room and Foyer should be separated from any group if they were part of a group before the Zone Scene was invoked.

One important of the features, benefits and objects in the present invention is that zones do not need to be separated before a zone scene is invoked. In one embodiment, a command is provided and links all zones in one step, if invoked. The command is in a form of a zone scene. After linking the appropriate zones, a zone scene command could apply the following attributes:

Set volumes levels in each zones (each zone can have a different volume)

Mute/Unmute zones.

Select and play specific music in the zones.

Set the play mode of the music (Shuffle, Repeat, Shuffle-repeat)

Set the music playback equalization of each zone (e.g., bass treble).

A further extension of this embodiment is to trigger a zone scene command as an alarm clock function. For instance the zone scene is set to apply at 8:00 am. It could link appropriate zones automatically, set specific music to play and then stop the music after a defined duration. Although a single zone may be assigned to an alarm, a scene set as an alarm clock provides a synchronized alarm, allowing any zones linked in the scene to play a predefined audio (e.g., a favorable song, a predefined playlist) at a specific time or for a specific duration. If, for any reason, the scheduled music failed to be played (e.g., an empty playlist, no connection to a share, failed UPnP, no Internet connection for an Internet Radio station), a backup buzzer will sound. This buzzer will be a sound file that is stored in a zone player.

FIG. 4 shows an exemplary user interface 400 that may be displayed on a controller 142 or a computer 110 of FIG. 1. The interface 400 shows a list of items that may be set up by a user to cause a scene to function at a specific time. In the embodiment shown in FIG. 4, the list of items includes “Alarm”, “Time”, “Zone”, “Music”, “Frequency” and “Alarm length”. “Alarm” can be set on or off. When “Alarm” is set on, “Time” is a specific time to set off the alarm. “Zone” shows which zone players are being set to play a specified audio at the specific time. “Music” shows what to be played when the specific time arrives. “Frequency” allows the user to define a frequency of the alarm. “Alarm length” defines how long the audio is to be played. It should be noted that the user interface 400 is provided herein to show some of the functions associated with setting up an alarm. Depending on an exact implementation, other functions, such as time zone, daylight savings, time synchronization, and time/date format for display may also be provided without departing from the present invention.

According to one embodiment, each zone player in a scene may be set up for different alarms. For example, a “Morning” scene includes three zone players, each in a bedroom, a den, and a dining room. After selecting the

10

scene, the user may set up an alarm for the scene as whole. As a result, each of the zone players will be activated at a specific time.

FIG. 5A shows a user interface 500 to allow a user to form a scene. The panel on the left shows the available zones in a household. The panel on the right shows the zones that have been selected and be grouped as part of this scene. Depending on an exact implementation of a user interface, Add/Remove buttons may be provided to move zones between the panels, or zones may be dragged along between panels.

FIG. 5B shows another user interface 520 to allow a user to form a scene. The user interface 520 that may be displayed on a controller or a computing device, lists available zones in a system. The list of zones in the user interface 520 includes ALL the zones in the system, including the zones that are already grouped. A checkbox is provide next to each of the zones so that a user may check in the zones to be associated with the scene.

FIG. 5C shows a user interface 510 to allow a user to adjust a volume level of the zone players in a zone scene individually or collectively. As shown in the user interface 510, the ‘Volumes . . .’ button (shown as sliders, other forms are possible) allows the user to affect the volumes of the associated zone players when a zone scene is invoked. In one embodiment, the zone players can be set to retain whatever volume that they currently have when the scene is invoked. Additionally the user can decide if the volumes should be unmuted or muted when the scene is invoked.

FIG. 6 shows a flowchart or process 600 of providing a player theme or a zone scene for a plurality of players, where one or more of the players are placed in a zone. The process 600 is presented in accordance with one embodiment of the present invention and may be implemented in a module to be located in the memory 282 of FIG. 2C.

The process 600 is initiated only when a user decides to proceed with a zone scene at 602. The process 600 then moves to 604 where it allows a user to decide which zone players to be associated with the scene. For example, there are ten players in a household, and the scene is named after “Morning”. The user may be given an interface to select four of the ten players to be associated with the scene. At 606, the scene is saved. The scene may be saved in any one of the members in the scene. In the example of FIG. 1, the scene is saved in one of the zone players and displayed on the controller 142. In operation, a set of data pertaining to the scene includes a plurality of parameters. In one embodiment, the parameters include, but may not be limited to, identifiers (e.g., IP address) of the associated players and a playlist. The parameters may also include volume/tone settings for the associated players in the scene. The user may go back to 602 to configure another scene if desired.

Given a saved scene, a user may activate the scene at any time or set up a timer to activate the scene at 610. The process 600 can continue when a saved scene is activated at 610. At 612, upon the activation of a saved scene, the process 600 checks the status of the players associated with the scene. The status of the players means that each of the players shall be in condition to react in a synchronized manner. In one embodiment, the interconnections of the players are checked to make sure that the players communicate among themselves and/or with a controller if there is such a controller in the scene.

It is assumed that all players associated with the scene are in good condition. At 614, commands are executed with the parameters (e.g., pertaining to a playlist and volumes). In one embodiment, data including the parameters is trans-

US 10,469,966 B2

11

ported from a member (e.g., a controller) to other members in the scene so that the players are caused to synchronize an operation configured in the scene. The operation may cause all players to play back a song in identical or different volumes or to play back a pre-stored file.

One of the features, benefits and advantages in the present invention is to allow sets of related devices (controllers and operating components) to exist as a group without interfering with other components that are potentially visible on the same wired or wireless network. Each of the sets is configured to a theme or a scene.

FIG. 7 shows an example user interface for invoking a zone scene. The user interface of FIG. 7 shows a Zone Menu that includes selectable indications of zone scenes.

FIG. 8 shows another example user interface for invoking a zone scene. FIG. 8 shows a Zone Menu that includes a softkey indicating a Scenes menu. Pressing the Scenes softkey will show the Scenes menu where all the available zone scenes are shown as selectable indications.

The present invention has been described in sufficient detail with a certain degree of particularity. It is understood to those skilled in the art that the present disclosure of embodiments has been made by way of examples only and that numerous changes in the arrangement and combination of parts may be resorted without departing from the spirit and scope of the invention as claimed. While the embodiments discussed herein may appear to include some limitations as to the presentation of the information units, in terms of the format and arrangement, the invention has applicability well beyond such embodiment, which can be appreciated by those skilled in the art. Accordingly, the scope of the present invention is defined by the appended claims rather than the forgoing description of embodiments.

I claim:

1. A computing device comprising: one or more processors;

a non-transitory computer-readable medium; and program instructions stored on the non-transitory computer-readable medium that, when executed by the one or more processors, cause the computing device to perform functions comprising:

while serving as a controller for a networked media playback system comprising a first zone player and at least two other zone players, wherein the first zone player is operating in a standalone mode in which the first zone player is configured to play back media individually;

receiving a first request to create a first zone scene comprising a first predefined grouping of zone players including at least the first zone player and a second zone player that are to be configured for synchronous playback of media when the first zone scene is invoked;

based on the first request, i) causing creation of the first zone scene, ii) causing an indication of the first zone scene to be transmitted to the first zone player, and iii) causing storage of the first zone scene;

receiving a second request to create a second zone scene comprising a second predefined grouping of zone players including at least the first zone player and a third zone player that are to be configured for synchronous playback of media when the second zone scene is invoked, wherein the third zone player is different than the second zone player;

based on the second request, i) causing creation of the second zone scene, ii) causing an indication of the second zone scene to be transmitted to the first zone player, and iii) causing storage of the second zone

12

scene; displaying a representation of the first zone scene and a representation of the second zone scene; and while displaying the representation of the first zone scene and the representation of the second zone scene, receiving a third request to invoke the first zone scene; and

based on the third request, causing the first zone player to transition from operating in the standalone mode to operating in accordance with the first predefined grouping of zone players such that the first zone player is configured to coordinate with at least the second zone player to output media in synchrony with output of media by at least the second zone player.

2. The computing device of claim 1, further comprising program instructions stored on the non-transitory computer-readable medium that, when executed by the one or more processors, cause the computing device to perform functions comprising:

while the first zone player is configured to coordinate with at least the second zone player to play back media in synchrony with at least the second zone player, receiving a fourth request to invoke the second zone scene; and

based on the fourth request, causing the first zone player to (a) cease to operate in accordance with the first predefined grouping of zone players such that the first zone player is no longer configured to coordinate with at least the second zone player to output media in synchrony with output of media by at least the second zone player and (b) begin to operate in accordance with the second predefined grouping of zone players such that the first zone player is configured to coordinate with at least the third zone player to output media in synchrony with output of media by at least the third zone player.

3. The computing device of claim 1, wherein causing storage of the first zone scene comprises causing storage of the first zone scene at a location other than the computing device, and wherein causing storage of the second zone scene comprises causing storage of the second zone scene at the location other than the computing device.

4. The computing device of claim 3, wherein the location other than the computing device comprises a zone player of the first predefined grouping of zone players.

5. The computing device of claim 1, wherein the first zone scene further comprises an indication of predetermined media to be played when the first zone scene is invoked, and wherein the computing device further comprises program instructions stored on the non-transitory computer-readable medium that, when executed by the one or more processors, cause the computing device to perform functions comprising:

based on the third request, causing the first zone player to coordinate with at least the second zone player to output the predetermined media in synchrony with output of the predetermined media by at least the second zone player.

6. The computing device of claim 1, wherein the first predefined grouping of zone players does not include the third zone player, and wherein the second predefined grouping of zone players does not include the second zone player.

7. The computing device of claim 1, further comprising program instructions stored on the non-transitory computer-readable medium that, when executed by the one or more processors, cause the computing device to perform functions comprising:

US 10,469,966 B2

13

before displaying the representation of the first zone scene and the representation of the second zone scene, receiving, from another device over a data network, data defining the first zone scene and data defining the second zone scene.

8. The computing device of claim 1, wherein receiving the first request comprises receiving a first set of one or more inputs via a user interface of the computing device, wherein receiving the second request comprises receiving a second set of one or more inputs via the user interface, and wherein receiving the third request comprises receiving a third set of one or more inputs via the user interface.

9. A non-transitory computer-readable medium, wherein the non-transitory computer-readable medium is provisioned with program instructions that are executable to cause a computing device to perform functions comprising:

while serving as a controller for a networked media playback system comprising a first zone player and at least two other zone players, wherein the first zone player is operating in a standalone mode in which the first zone player is configured to play back media individually;

receiving a first request to create a first zone scene comprising a first predefined grouping of zone players including at least the first zone player and a second zone player that are to be configured for synchronous playback of media when the first zone scene is invoked; based on the first request, i) causing creation of the first zone scene, ii) causing an indication of the first zone scene to be transmitted to the first zone player, and iii) causing storage of the first zone scene;

receiving a second request to create a second zone scene comprising a second predefined grouping of zone players including at least the first zone player and a third zone player that are to be configured for synchronous playback of media when the second zone scene is invoked, wherein the third zone player is different than the second zone player;

based on the second request, i) causing creation of the second zone scene, ii) causing an indication of the second zone scene to be transmitted to the first zone player, and iii) causing storage of the second zone scene;

displaying a representation of the first zone scene and a representation of the second zone scene; and

while displaying the representation of the first zone scene and the representation of the second zone scene, receiving a third request to invoke the first zone scene; and based on the third request, causing the first zone player to transition from operating in the standalone mode to operating in accordance with the first predefined grouping of zone players such that the first zone player is configured to coordinate with at least the second zone player to output media in synchrony with output of media by at least the second zone player.

10. The non-transitory computer-readable medium of claim 9, wherein the non-transitory computer-readable medium is also provisioned with program instructions stored on the non-transitory computer-readable medium that, when executed by the one or more processors, cause the computing device to perform functions comprising:

while the first zone player is configured to coordinate with at least the second zone player to play back media in synchrony with at least the second zone player, receiving a fourth request to invoke the second zone scene; and

14

based on the fourth request, causing the first zone player to (a) cease to operate in accordance with the first predefined grouping of zone players such that the first zone player is no longer configured to coordinate with at least the second zone player to output media in synchrony with output of media by at least the second zone player and (b) begin to operate in accordance with the second predefined grouping of zone players such that the first zone player is configured to coordinate with at least the third zone player to output media in synchrony with output of media by at least the third zone player.

11. The non-transitory computer-readable medium of claim 9, wherein causing storage of the first zone scene comprises causing storage of the first zone scene at a location other than the computing device, and wherein causing storage of the second zone scene comprises causing storage of the second zone scene at the location other than the computing device.

12. The non-transitory computer-readable medium of claim 11, wherein the location other than the computing device comprises a zone player of the first predefined grouping of zone players.

13. The non-transitory computer-readable medium of claim 9, wherein the first zone scene further comprises an indication of predetermined media to be played when the first zone scene is invoked, and wherein the non-transitory computer-readable medium is also provisioned with program instructions stored on the non-transitory computer-readable medium that, when executed by the one or more processors, cause the computing device to perform functions comprising:

based on the third request, causing the first zone player to coordinate with at least the second zone player to output the predetermined media in synchrony with output of the predetermined media by at least the second zone player.

14. The non-transitory computer-readable medium of claim 9, wherein the first predefined grouping of zone players does not include the third zone player, and wherein the second predefined grouping of zone players does not include the second zone player.

15. The non-transitory computer-readable medium of claim 9, wherein the non-transitory computer-readable medium further comprises program instructions stored on the non-transitory computer-readable medium that, when executed by the one or more processors, cause the computing device to perform functions comprising:

before displaying the representation of the first zone scene and the representation of the second zone scene, receiving, from another device over a data network, data defining the first zone scene and data defining the second zone scene.

16. The non-transitory computer-readable medium of claim 9, wherein receiving the first request comprises receiving a first set of one or more inputs via a user interface of the computing device, wherein receiving the second request comprises receiving a second set of one or more inputs via the user interface, and wherein receiving the third request comprises receiving a third set of one or more inputs via the user interface.

17. A method executed by a computing device, the method comprising:

while serving as a controller for a networked media playback system comprising a first zone player and at least two other zone players, wherein the first zone

US 10,469,966 B2

15

player is operating in a standalone mode in which the first zone player is configured to play back media individually;

receiving a first request to create a first zone scene comprising a first predefined grouping of zone players including at least the first zone player and a second zone player that are to be configured for synchronous playback of media when the first zone scene is invoked; based on the first request, i) causing creation of the first zone scene, ii) causing an indication of the first zone scene to be transmitted to the first zone player, and iii) causing storage of the first zone scene;

receiving a second request to create a second zone scene comprising a second predefined grouping of zone players including at least the first zone player and a third zone player that are to be configured for synchronous playback of media when the second zone scene is invoked, wherein the third zone player is different than the second zone player;

based on the second request, i) causing creation of the second zone scene, ii) causing an indication of the second zone scene to be transmitted to the first zone player, and iii) causing storage of the second zone scene;

displaying a representation of the first zone scene and a representation of the second zone scene; and

while displaying the representation of the first zone scene and the representation of the second zone scene, receiving a third request to invoke the first zone scene; and based on the third request, causing the first zone player to transition from operating in the standalone mode to operating in accordance with the first predefined group-

16

ing of zone players such that the first zone player is configured to coordinate with at least the second zone player to output media in synchrony with output of media by at least the second zone player.

18. The method of claim **17**, further comprising:

while the first zone player is configured to coordinate with at least the second zone player to play back media in synchrony with at least the second zone player, receiving a fourth request to invoke the second zone scene; and

based on the fourth request, causing the first zone player to (a) cease to operate in accordance with the first predefined grouping of zone players such that the first zone player is no longer configured to coordinate with at least the second zone player to output media in synchrony with output of media by at least the second zone player and (b) begin to operate in accordance with the second predefined grouping of zone players such that the first zone player is configured to coordinate with at least the third zone player to output media in synchrony with output of media by at least the third zone player.

19. The method of claim **17**, wherein causing storage of the first zone scene comprises causing storage of the first zone scene at a location other than the computing device, wherein causing storage of the second zone scene comprises causing storage of the second zone scene at the location other than the computing device.

20. The method of claim **19**, wherein the location other than the computing device comprises a zone player of the first predefined grouping of zone players.

* * * * *

EXHIBIT 5

US009219460B2

(12) **United States Patent**
Bush

(10) **Patent No.:** **US 9,219,460 B2**
(45) **Date of Patent:** **Dec. 22, 2015**

(54) **AUDIO SETTINGS BASED ON ENVIRONMENT**

(71) Applicant: **Sonos, Inc.**, Santa Barbara, CA (US)

(72) Inventor: **William H. Bush**, Santa Barbara, CA (US)

(73) Assignee: **Sonos, Inc.**, Santa Barbara, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 143 days.

6,522,886 B1	2/2003	Youngs et al.
6,611,537 B1	8/2003	Edens et al.
6,631,410 B1	10/2003	Kowalski et al.
6,704,421 B1	3/2004	Kitamura
6,721,428 B1	4/2004	Allred et al.
6,757,517 B2	6/2004	Chang
6,766,025 B1	7/2004	Levy et al.
6,778,869 B2	8/2004	Champion
6,916,980 B2	7/2005	Ishida et al.
6,931,134 B1	8/2005	Waller, Jr. et al.
7,058,186 B2	6/2006	Tanaka
7,103,187 B1	9/2006	Neuman
7,130,608 B2	10/2006	Hollstrom et al.

(Continued)

FOREIGN PATENT DOCUMENTS

WO 0153994 7/2001

OTHER PUBLICATIONS

(21) Appl. No.: **14/216,306**

(22) Filed: **Mar. 17, 2014**

(65) Prior Publication Data

US 2015/0263692 A1 Sep. 17, 2015

Written Opinion of the International Searching Authority for PCT/US2015/021000, dated Jun. 5, 2015.*

(Continued)

(51) Int. Cl.

H03G 5/16 (2006.01)

H04R 3/00 (2006.01)

H04R 29/00 (2006.01)

(52) U.S. Cl.

CPC **H03G 5/165** (2013.01); **H04R 3/00** (2013.01); **H04R 29/00** (2013.01)

(58) Field of Classification Search

None

See application file for complete search history.

Primary Examiner — Brenda Bernardi

(74) Attorney, Agent, or Firm — McDonnell Boehnen Hulbert & Berghoff LLP

(57) ABSTRACT

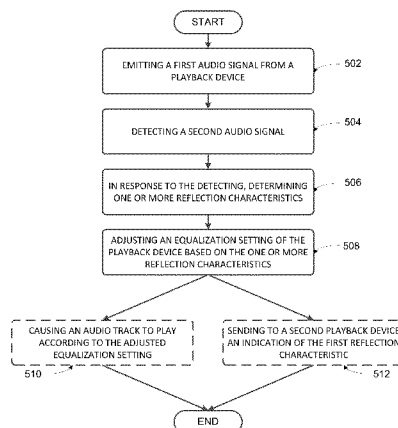
Embodiments described herein may involve dynamically adjusting the equalization of a playback device based on the environment in which the playback device is operating. One embodiment may involve emitting a first audio signal from a playback device, detecting, by the playback device, a second audio signal, where at least a portion of the second audio signal is a reflection of the first audio signal, in response to the detecting, determining one or more reflection characteristics, where each of the one or more reflection characteristics are based on at least the second audio signal, adjusting an equalization setting of the playback device based on the one or more reflection characteristics, and causing an audio track to play according to the adjusted equalization setting.

20 Claims, 9 Drawing Sheets

(56) References Cited

U.S. PATENT DOCUMENTS

4,306,113 A	12/1981	Morton
4,592,088 A	5/1986	Shimada
5,218,710 A	6/1993	Yamaki et al.
5,386,478 A	1/1995	Plunkett
5,553,147 A	9/1996	Pineau
5,923,902 A	7/1999	Inagaki
6,256,554 B1	7/2001	DiLorenzo
6,404,811 B1	6/2002	Cvetko et al.



US 9,219,460 B2

Page 2

(56)

References Cited

U.S. PATENT DOCUMENTS

7,130,616	B2	10/2006	Janik	
7,143,939	B2	12/2006	Henzerling	
7,236,773	B2	6/2007	Thomas	
7,483,538	B2	1/2009	McCarty et al.	
7,489,784	B2	2/2009	Yoshino	
7,492,909	B2	2/2009	Carter	
7,529,377	B2	5/2009	Nackvi et al.	
7,571,014	B1	8/2009	Lambourne et al.	
7,630,501	B2	12/2009	Blank et al.	
7,643,894	B2	1/2010	Braithwaite et al.	
7,657,910	B1	2/2010	McAulay et al.	
7,676,044	B2	3/2010	Sasaki et al.	
7,853,341	B2	12/2010	McCarty et al.	
7,949,140	B2	5/2011	Kino	
7,961,893	B2	6/2011	Kino	
8,014,423	B2	9/2011	Thaler et al.	
8,045,952	B2	10/2011	Qureshey et al.	
8,103,009	B2	1/2012	McCarty et al.	
8,131,390	B2	3/2012	Braithwaite et al.	
8,194,874	B2	6/2012	Starobin et al.	
8,234,395	B2	7/2012	Millington	
8,270,620	B2	9/2012	Christensen	
8,325,931	B2 *	12/2012	Howard	H04R 29/003 324/525
8,401,202	B2	3/2013	Brooking	
8,577,048	B2	11/2013	Chaikin et al.	
8,819,554	B2	8/2014	Basso et al.	
2001/0042107	A1	11/2001	Palm	
2002/0022453	A1	2/2002	Balog et al.	
2002/0026442	A1	2/2002	Lipscomb et al.	
2002/0078161	A1	6/2002	Cheng	
2002/0124097	A1	9/2002	Isely et al.	
2003/0002689	A1	1/2003	Folio	
2003/0157951	A1	8/2003	Hasty	
2003/0161479	A1	8/2003	Yang et al.	
2004/0024478	A1	2/2004	Hans et al.	
2004/0237750	A1	12/2004	Smith et al.	
2005/0147261	A1	7/2005	Yeh	
2005/0157885	A1	7/2005	Olney et al.	
2007/0003067	A1	1/2007	Gierl et al.	
2007/0142944	A1	6/2007	Goldberg et al.	
2008/0002839	A1	1/2008	Eng	
2008/0098027	A1	4/2008	Aarts	
2008/0144864	A1	6/2008	Huon	
2008/0175411	A1	7/2008	Greve	
2009/0024662	A1	1/2009	Park et al.	
2009/0047993	A1	2/2009	Vasa	
2009/0110218	A1 *	4/2009	Swain	H03G 5/165 381/300
2010/0195846	A1 *	8/2010	Yokoyama	H03G 7/007 381/102
2011/0091055	A1	4/2011	LeBlanc	

2013/0129122	A1	5/2013	Johnson et al.	
2013/0216071	A1 *	8/2013	Maher	H04R 3/04 381/303
2014/0037097	A1	1/2014	Labosco	

OTHER PUBLICATIONS

AudioTron Setup Guide, Version 3.0, Voyetra Turtle Beach, Inc., May 2002, 38 pages.

"Bluetooth. "Specification of the Bluetooth System: The ad hoc SCATTERNET for affordable and highly functional wireless connectivity" Core, Version 1.0 A, Jul. 26, 1999, 1068 pages".

"Bluetooth. "Specification of the Bluetooth System: Wireless connections made easy" Core, Version 1.0 B, Dec. 1, 1999, 1076 pages".

"Dell, Inc. "Dell Digital Audio Receiver: Reference Guide" Jun. 2000, 70 pages".

"Dell, Inc. "Start Here" Jun. 2000, 2 pages".

"Jones, Stephen. "Dell Digital Audio Receiver: Digital upgrade for your analog stereo" Analog Stereo. Jun. 24, 2000 <<http://www.reviewsonline.com/articles/961906864.htm>> retrieved Jun. 18, 2014, 2 pages".

"Louderback, Jim. "Affordable Audio Receiver Furnishes Homes With MP3" TechTV Vault. Jun. 28, 2000 <<http://www.g4tv.com/articles/17923/affordable-audio-receiver-furnishes-homes-with-mp3/>> retrieved Jul. 10, 2014, 2 pages".

"Palm, Inc. "Handbook for the Palm VII Handheld" May 2000, 311 pages".

"Presentations at WinHEC 2000" May 2000, 138 pages.

"AudioTron Quick Start Guide, Version 1.0", Voyetra Turtle Beach, Inc., Mar. 2001, 24 pages.

"AudioTron Reference Manual, Version 3.0", Voyetra Turtle Beach, Inc., May 2002, 70 pages.

"AudioTron Setup Guide, Version 3.0", Voyetra Turtle Beach, Inc., May 2002, 38 pages.

Jo J., et al., "Synchronized One-to-many Media Streaming with Adaptive Playout Control," Proceedings of SPIE, 2002, vol. 4861, pp. 71-82.

"UPnP; "Universal Plug and Play Device Architecture"; Jun. 8, 2000; version 1.0; Microsoft Corporation; pp. 1-54".

"Constellation Acoustic System: a revolutionary breakthrough in acoustical design" Meyer Sound Laboratories, Inc., <http://www.meyersound.com/pdf/brochures/constellation_brochure_c.pdf> 2012, 32 pages".

"Constellation Microphones," Meyer Sound Laboratories, Inc., <http://www.meyersound.com/sites/default/files/constellation_microphones.pdf> 2013, 2 pages".

"Ross, Alex. "Wizards of Sound: Retouching acoustics, from the restaurant to the concert hall" The New Yorker, Feb. 23, 2015. Web. Feb. 26, 2015".

* cited by examiner

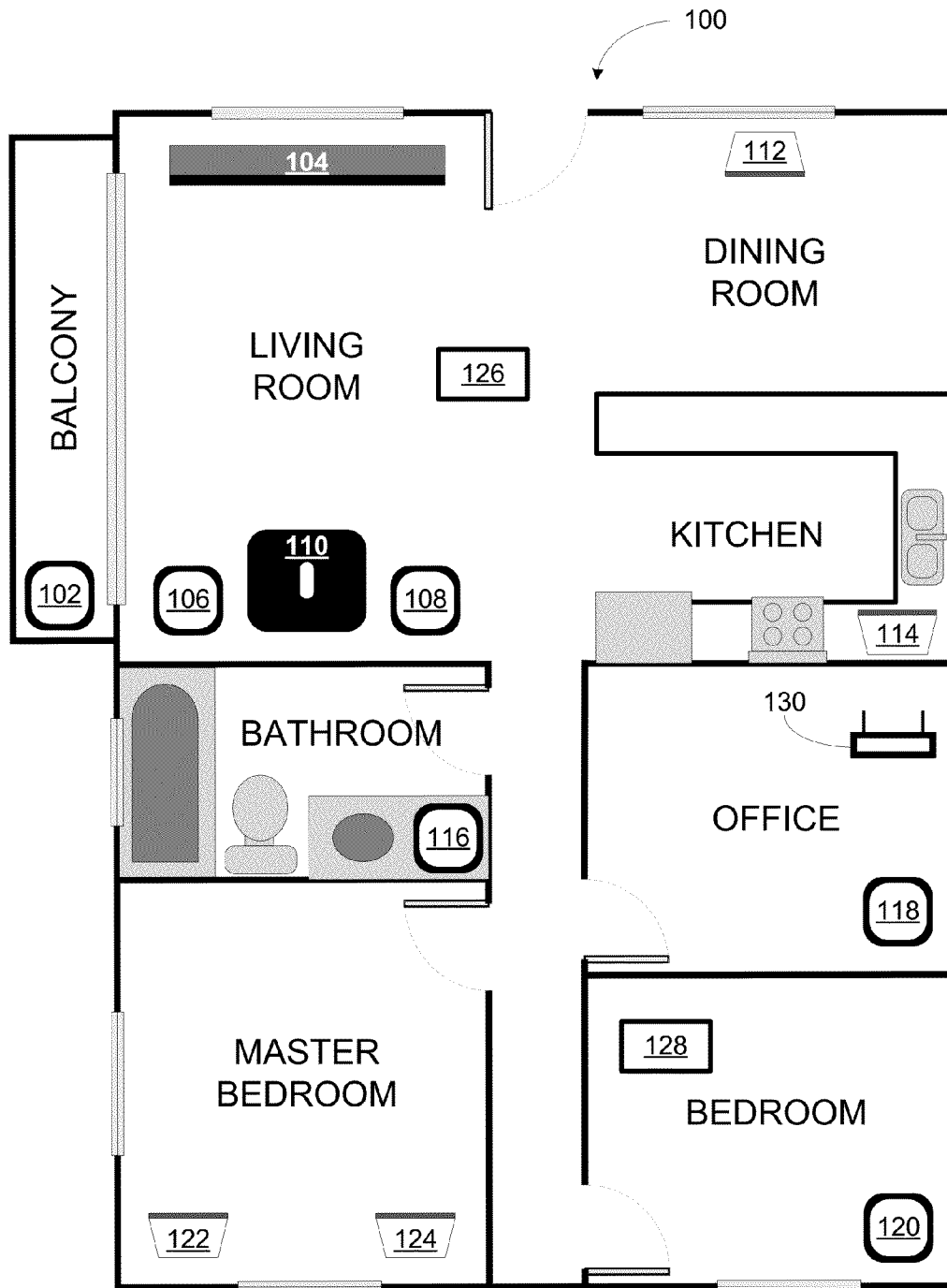


FIGURE 1

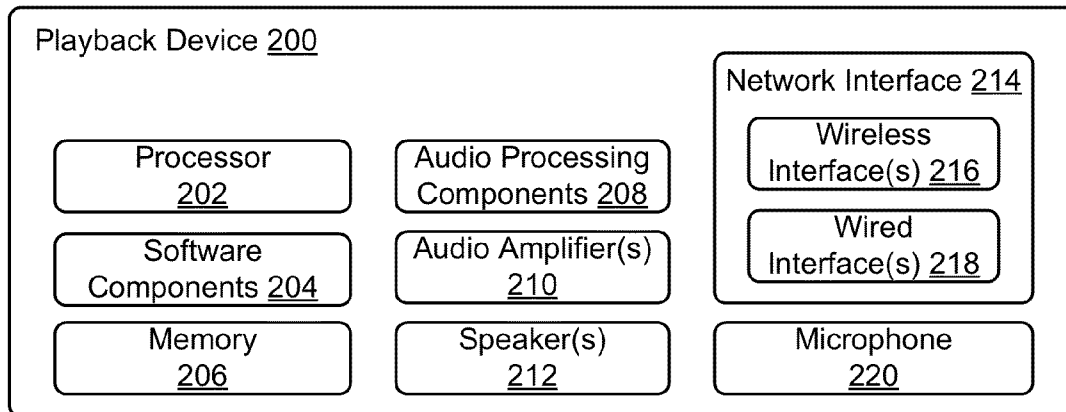


FIGURE 2

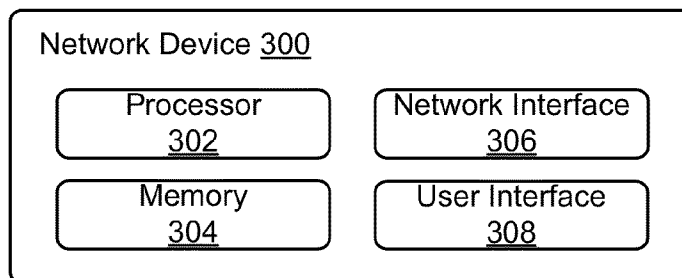


FIGURE 3

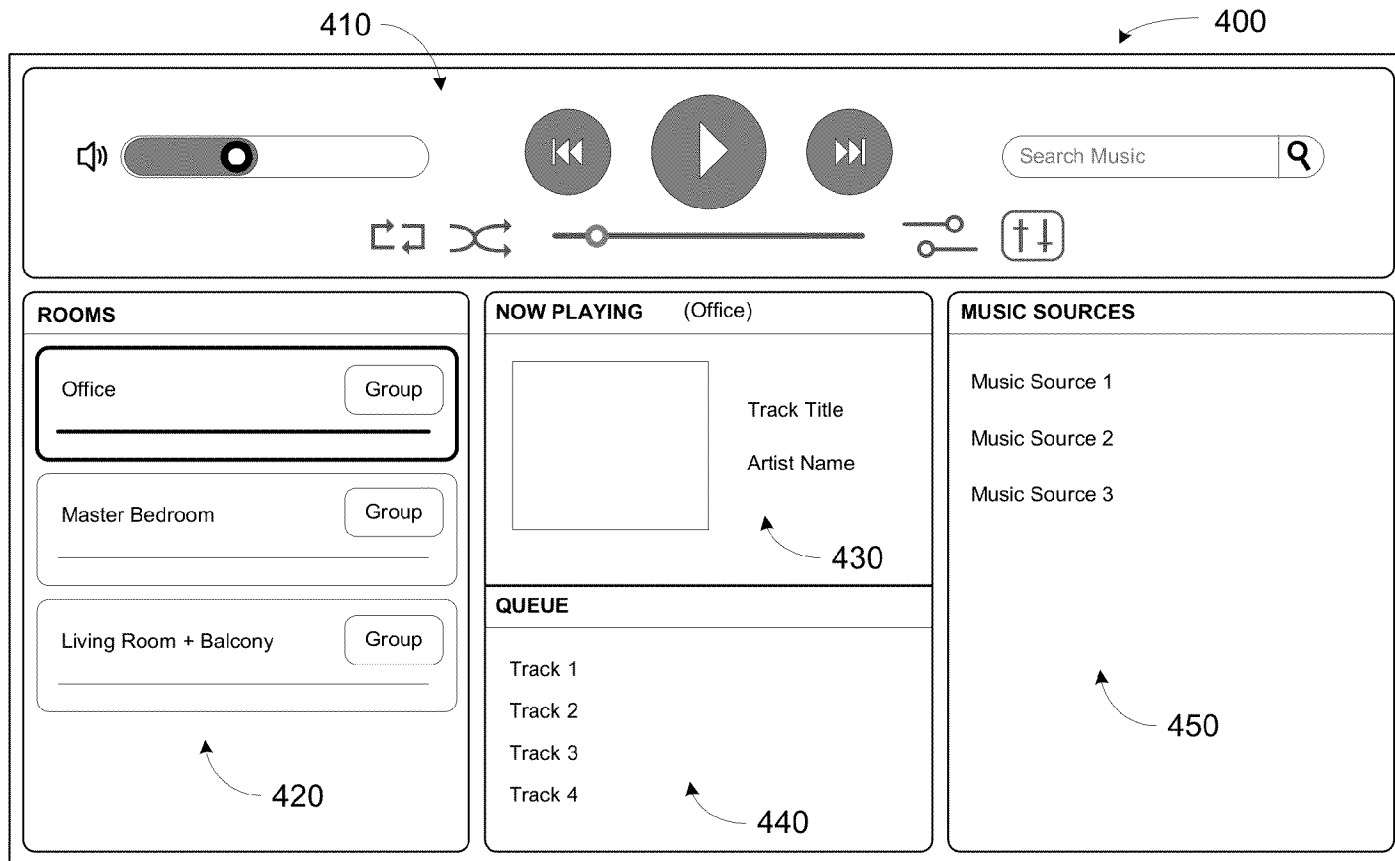


FIGURE 4

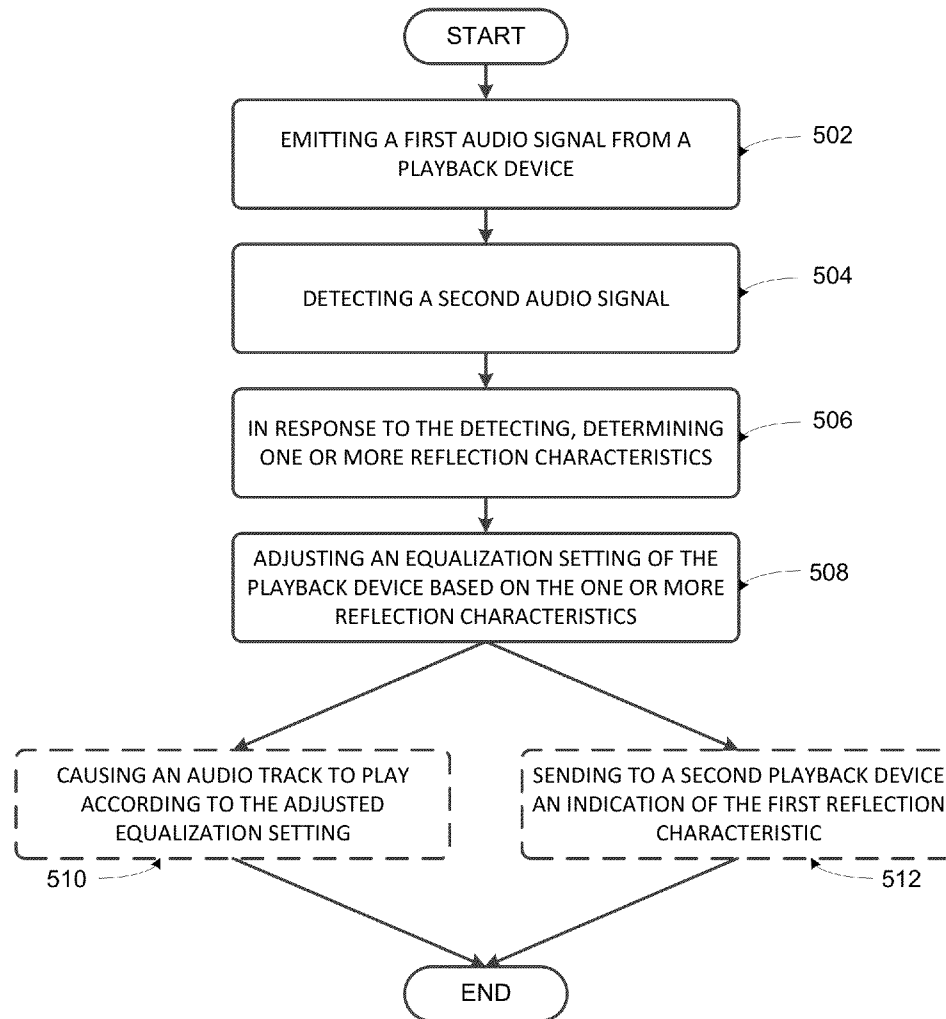


FIGURE 5

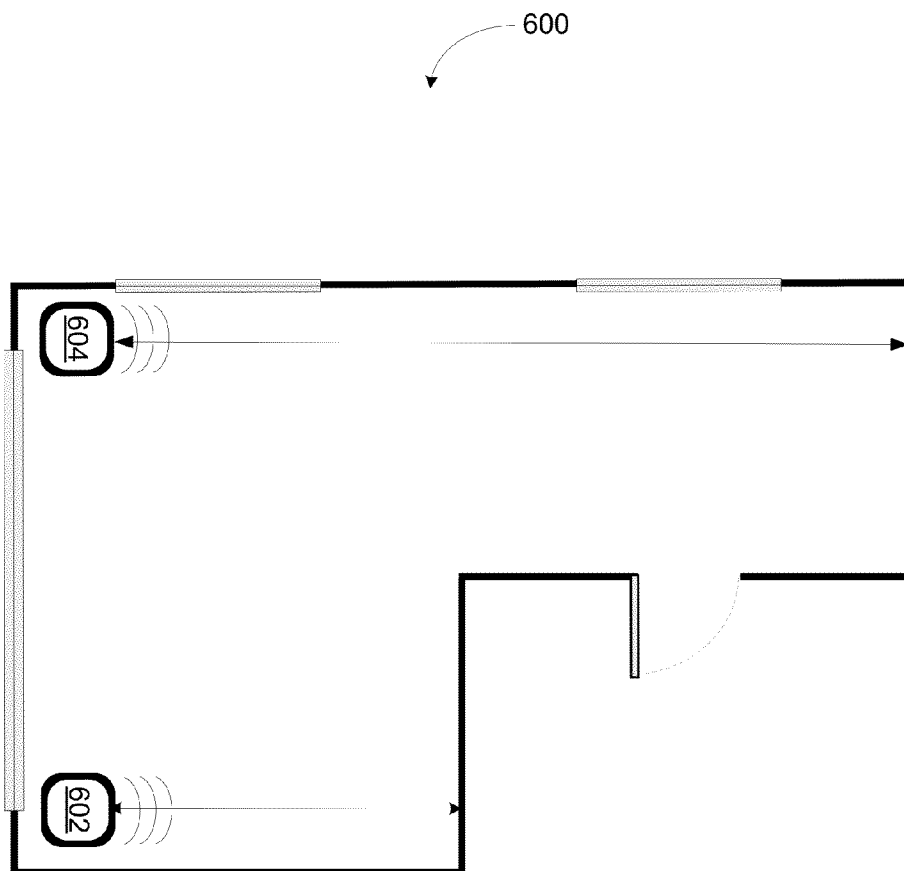


FIGURE 6

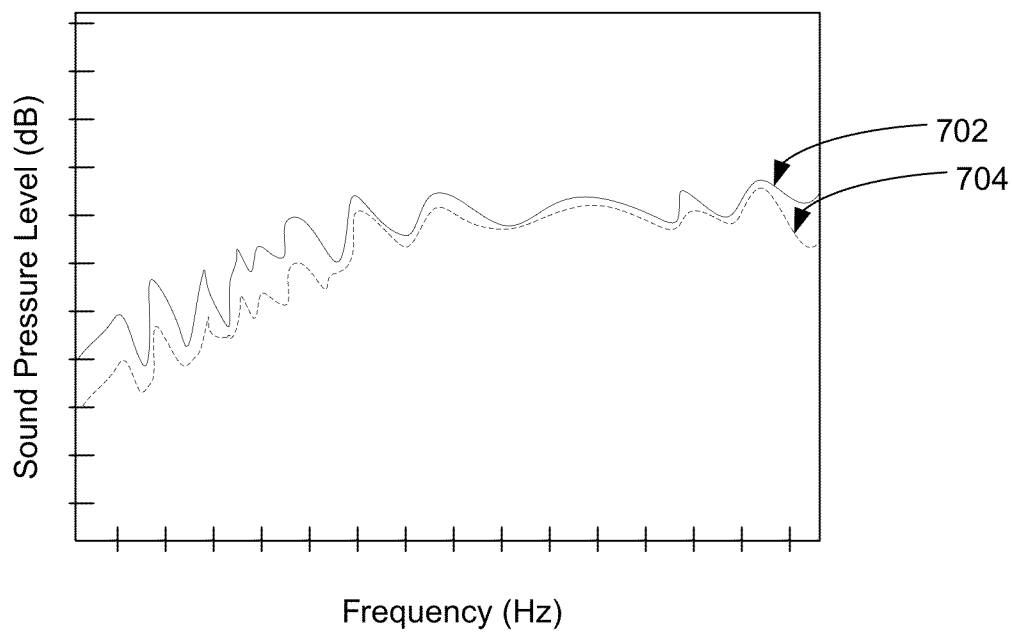


FIGURE 7

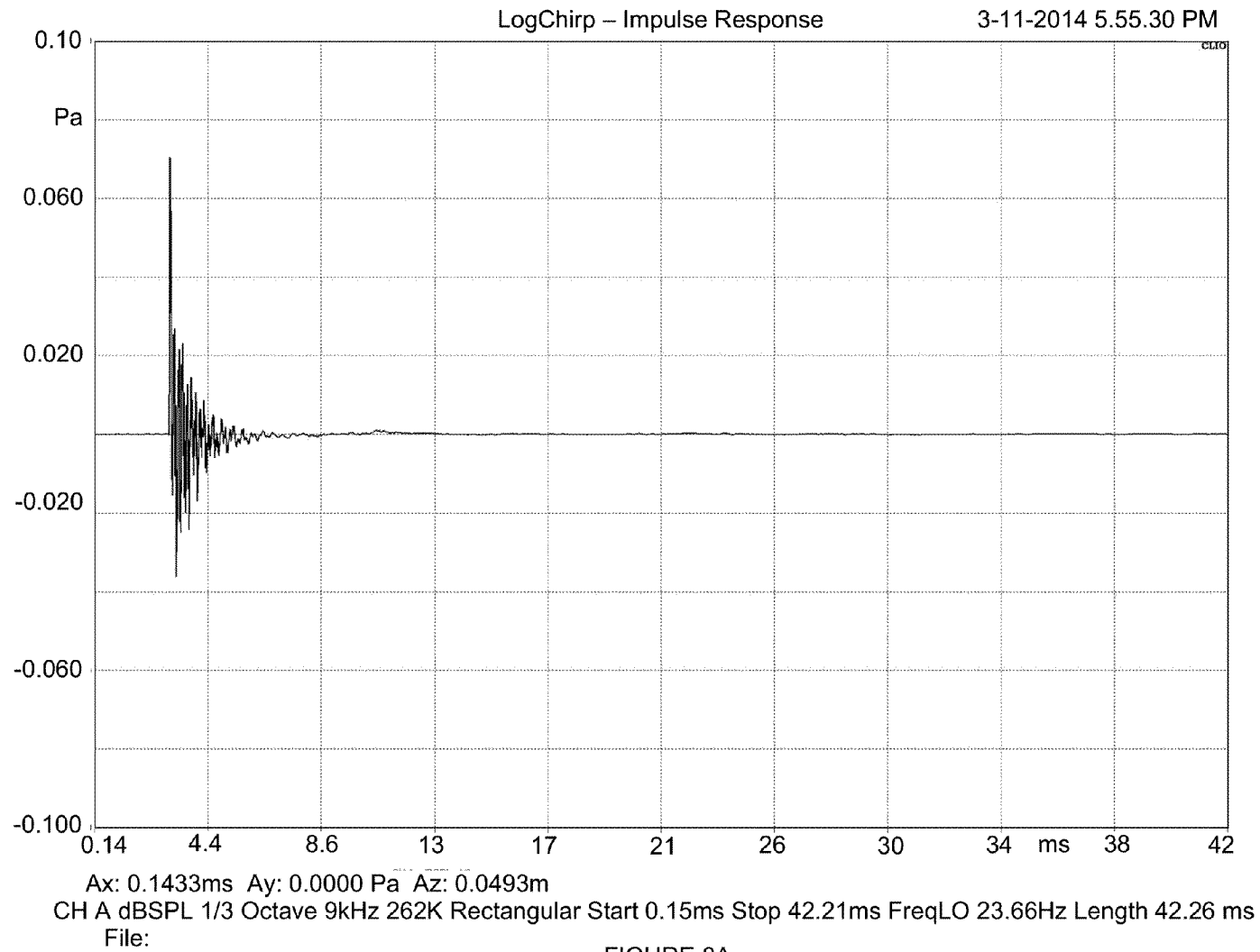
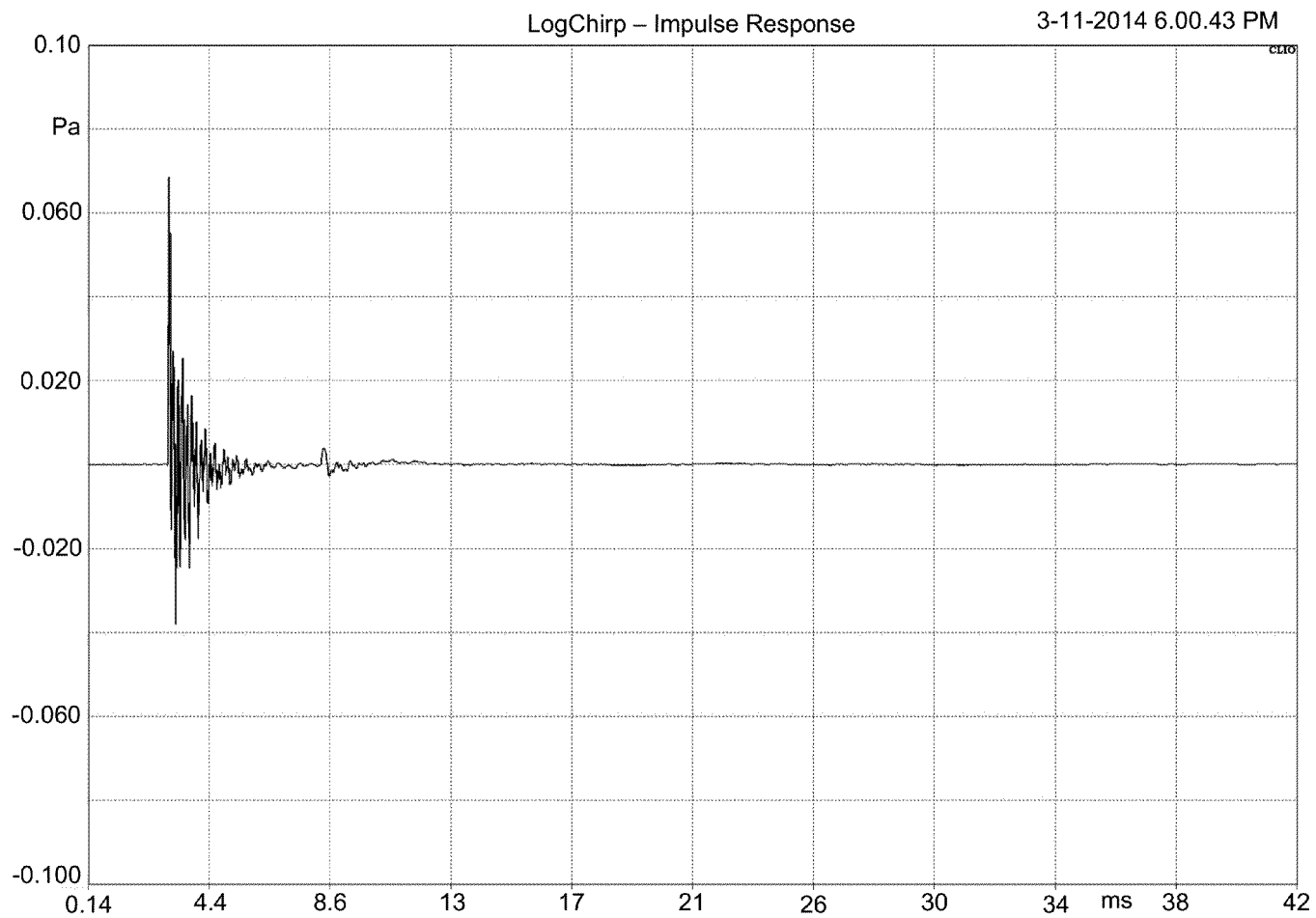


FIGURE 8A



Ax: 0.1433ms Ay: 0.0000 Pa Az: 0.0493m

CH A dB SPL 1/3 Octave 9kHz 262K Rectangular Start 0.15ms Stop 42.21ms FreqLO 23.66Hz Length 42.26 ms

File:

FIGURE 8B

U.S. Patent

Dec. 22, 2015

Sheet 9 of 9

US 9,219,460 B2

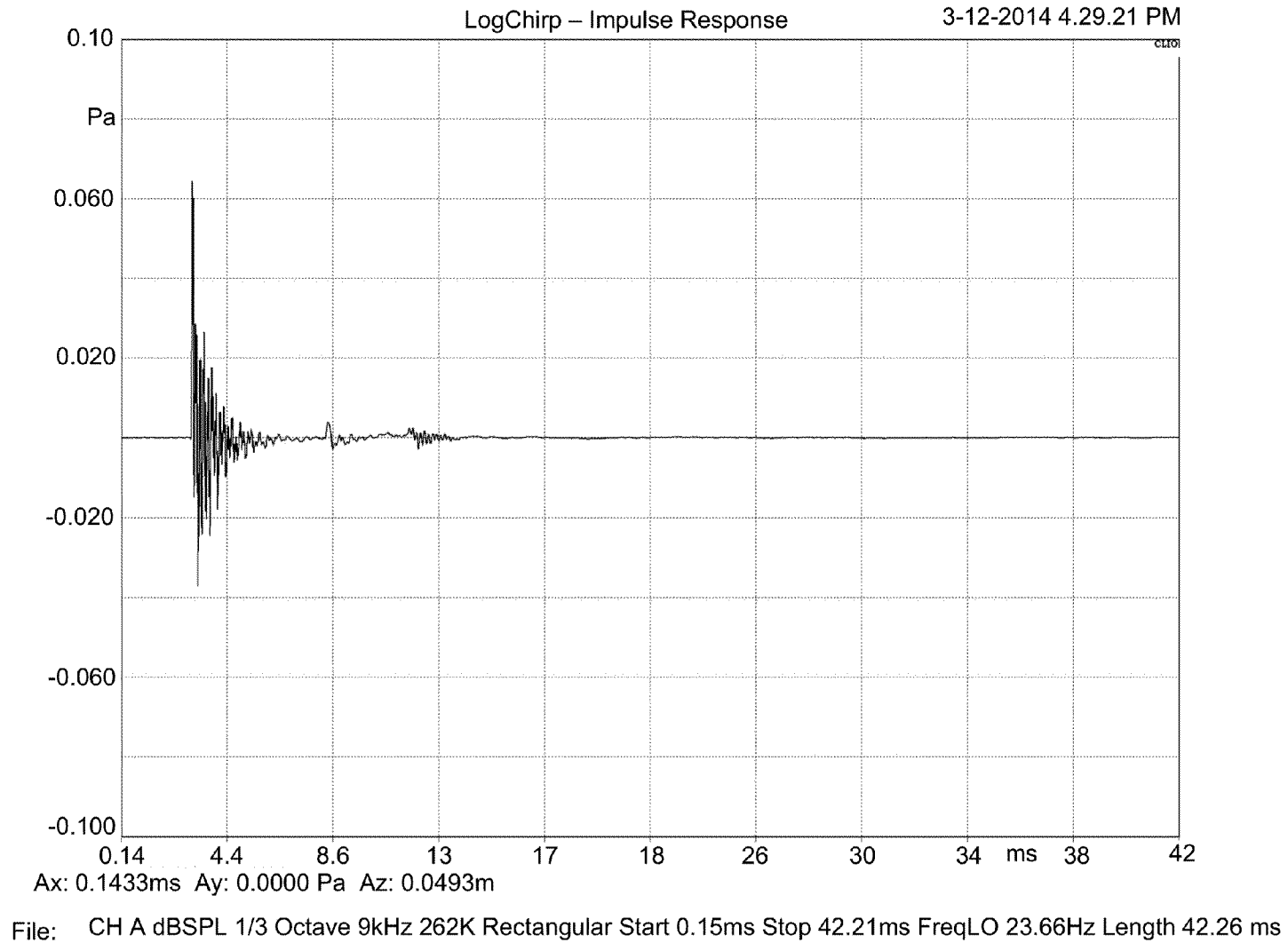


FIGURE 8C

US 9,219,460 B2

1

**AUDIO SETTINGS BASED ON
ENVIRONMENT**

FIELD OF THE DISCLOSURE

The disclosure is related to consumer goods and, more particularly, to methods, systems, products, features, services, and other elements directed to media playback or some aspect thereof.

BACKGROUND

Options for accessing and listening to digital audio in an out-loud setting were limited until in 2003, when SONOS, Inc. filed for one of its first patent applications, entitled “Method for Synchronizing Audio Playback between Multiple Networked Devices,” and began offering a media playback system for sale in 2005. The Sonos Wireless HiFi System enables people to experience music from many sources via one or more networked playback devices. Through a software control application installed on a smartphone, tablet, or computer, one can play what he or she wants in any room that has a networked playback device. Additionally, using the controller, for example, different songs can be streamed to each room with a playback device, rooms can be grouped together for synchronous playback, or the same song can be heard in all rooms synchronously.

Given the ever growing interest in digital media, there continues to be a need to develop consumer-accessible technologies to further enhance the listening experience.

BRIEF DESCRIPTION OF THE DRAWINGS

Features, aspects, and advantages of the presently disclosed technology may be better understood with regard to the following description, appended claims, and accompanying drawings where:

FIG. 1 shows an example media playback system configuration in which certain embodiments may be practiced;

FIG. 2 shows a functional block diagram of an example playback device;

FIG. 3 shows a functional block diagram of an example control device;

FIG. 4 shows an example controller interface;

FIG. 5 shows an example flow diagram for dynamically adjusting the equalization of a playback device based on the environment in which the playback device is operating;

FIG. 6 shows another example media playback system configuration in which certain embodiments may be practiced; and

FIG. 7 shows illustrative frequency responses of the playback device.

FIGS. 8A-8C show example impulse responses of a playback device.

The drawings are for the purpose of illustrating example embodiments, but it is understood that the inventions are not limited to the arrangements and instrumentality shown in the drawings.

DETAILED DESCRIPTION

I. Overview

Embodiments described herein involve dynamically adjusting the equalization of a playback device based on the environment in which the playback device is operating. While a playback device may be factory configured to perform

2

advantageously in a typical operating environment, the factory configuration may not be ideal for all environments. Therefore, adjusting the equalization of the playback device based on the current operating environment may improve the listening experience for some listeners.

Consider that, as one example, a playback device may be configured to perform advantageously in a small room, but nonetheless may come to be positioned outdoors. When operating outdoors, boosting the bass levels of the playback may result in an improved listening experience for some users. Other such examples may exist as well.

Some audio playback systems implement a manual approach for adjustment of equalization based on environment. Under this approach, a microphone is cabled to a given component of an audio system, such as an amplifier or an audio-video receiver. A user is then expected to position the microphone in a position in which the user would typically listen to the audio system. The given component of the audio system then drives audio output to one or more speakers. Then, the speaker output is detected by the microphone. Playback of the audio component is then adjusted based on the speaker output detected by the microphone.

Such a manual approach has several disadvantages. First, the adjustment process is often overlooked by the user because, for example, the user may be required to initiate the adjustment and position the microphone. Second, the adjustment process requires a separate microphone, which may not be included with any of the components of the audio system. Third, the manual approach does not lend itself to frequent adjustment when one or more of the speakers may be repositioned in different locations throughout a home or outdoors. Therefore, an improved, dynamic approach to adjustment based on environment is desired.

Described herein are example methods and systems for dynamically adjusting equalization of a playback device based on the environment in which the playback device is operating. An example playback device may include a speaker, a microphone, and a processor. The playback device may emit an audio signal, such as a pulse, from the speaker. As the audio signal propagates, the signal may encounter various objects, such as walls and furniture, throughout the environment. When an object is encountered, the object may variably reflect or absorb portions of the audio signal. For instance, when the audio signal encounters an interior wall, a portion of the audio signal may be reflected by the interior wall. The portion of the audio signal may then encounter other objects that variably reflect or absorb some of the portion in turn. At some point, a portion of the reflected audio signal may reflect back toward the playback device from which the audio signal was emitted. The microphone of the playback device may then detect at least a portion of the reflected audio signal.

In response to detecting the reflected audio signal, the playback device may determine one or more reflection characteristics based on the reflected audio signal. For example, the playback device may determine an amount of time from when the playback device emitted the first audio signal to when the playback device detected the reflected audio signal. The amount of time may indicate the nature of the environment. For instance, a relatively short amount of time may indicate that the playback device is in a small room while a relatively amount of time may indicate that the playback device is in a large room. Alternatively, the playback device may determine the sound pressure level of the second audio signal. A relatively low sound pressure level may indicate that there is relatively more absorptive material in the environment as compared with a relatively higher sound pressure

level. Or the relatively low sound pressure level may indicate that the first audio signal travelled a relatively longer distance before reflecting. Other reflection characteristics may exist, as may many other examples of indications regarding the nature of the environment.

The playback device may then adjust an equalization setting of the playback device based on the one or more reflection characteristics. Further, two or more reflection characteristics may be used in combination. For instance, a relatively long amount of time and a relatively low sound pressure level may indicate that the playback device is either presumed to be outside or in a very large room. In either case, the playback device may adjust the equalization setting based on that environment. In the above instance, where the playback device is either outside or in a very large room, the bass frequencies of the playback device may be increased, which may, to some listeners, improve enjoyment of the audio played by the playback device in the more spacious environment. In contrast, where the reflection characteristics indicate that the playback device is in a small room, the bass frequencies of the playback device may be decreased, which may improve enjoyment of the audio played by the playback device in the small room. Once the equalization setting is adjusted, the playback device may then play an audio track according to the equalization setting.

As indicated above, the present application involves dynamically adjusting the equalization of a playback device based on the environment in which the playback device is operating. In one aspect, a method is provided. The method involves emitting, by a playback device, a first audio signal, detecting, by the playback device, a second audio signal, where at least a portion of the second audio signal is a reflection of the first audio signal, in response to the detecting, determining one or more reflection characteristics, where each of the one or more reflection characteristics are based on at least the second audio signal, adjusting an equalization setting of the playback device based on the one or more reflection characteristics; and causing an audio track to play according to the adjusted equalization setting.

In another aspect, a second method is provided. The second method is operable in a media playback system comprising a plurality of playback devices, where each playback device comprises a respective microphone and a respective speaker. The second method involves receiving an indication of a first audio signal, detecting, by a microphone of the first playback device, a second audio signal, where at least a portion of the second audio signal is indicative of the first audio signal, in response to the detecting, determining a first reflection characteristic based on the second audio signal, adjusting an equalization setting of the first playback device based on at least the first reflection characteristic, and sending to a second media playback device an indication of the first reflection characteristic.

In another aspect, a device is provided. The device includes a speaker, a microphone that is physically coupled to the speaker, a processor, a network interface, a data storage, and a program logic stored in the data storage. The program logic is executable by the processor to emit a first audio signal from the speaker, detect, via the microphone, a second audio signal, wherein at least a portion of the second audio signal is a reflection of the first audio signal, in response to the detecting, determine a first reflection characteristic based on at least the second audio signal, adjust an equalization setting of the playback device based on at least the first reflection characteristic, and play, via the speaker, an audio track according to the equalization setting.

In yet another aspect, a non-transitory computer readable memory is provided. The non-transitory computer readable memory has stored thereon instructions executable by a computing device to cause the computing device to perform functions. The functions include emitting, by a playback device, a first audio signal, detecting, by the playback device, a second audio signal, wherein at least a portion of the second audio signal is a reflection of the first audio signal, in response to the detecting, determining one or more reflection characteristics, wherein each of the one or more reflection characteristics are based on at least the second audio signal, adjusting an equalization setting of the playback device based on the one or more reflection characteristics; and causing an audio track to play according to the adjusted equalization setting.

It will be understood by one of ordinary skill in the art that this disclosure includes numerous other embodiments.

II. Example Operating Environment

FIG. 1 shows an example configuration of a media playback system 100 in which one or more embodiments disclosed herein may be practiced or implemented. The media playback system 100 as shown is associated with an example home environment having several rooms and spaces, such as for example, a master bedroom, an office, a dining room, and a living room. As shown in the example of FIG. 1, the media playback system 100 includes playback devices 102-124, control devices 126 and 128, and a wired or wireless network router 130.

Further discussions relating to the different components of the example media playback system 100 and how the different components may interact to provide a user with a media experience may be found in the following sections. While discussions herein may generally refer to the example media playback system 100, technologies described herein are not limited to applications within, among other things, the home environment as shown in FIG. 1. For instance, the technologies described herein may be useful in environments where multi-zone audio may be desired, such as, for example, a commercial setting like a restaurant, mall or airport, a vehicle like a sports utility vehicle (SUV), bus or car, a ship or boat, an airplane, and so on.

a. Example Playback Devices

FIG. 2 shows a functional block diagram of an example playback device 200 that may be configured to be one or more of the playback devices 102-124 of the media playback system 100 of FIG. 1. The playback device 200 may include a processor 202, software components 204, memory 206, audio processing components 208, audio amplifier(s) 210, speaker(s) 212, a network interface 214 including wireless interface(s) 216 and wired interface(s) 218 and a microphone 220. In one case, the playback device 200 may not include the speaker(s) 212, but rather a speaker interface for connecting the playback device 200 to external speakers. In another case, the playback device 200 may include neither the speaker(s) 212 nor the audio amplifier(s) 210, but rather an audio interface for connecting the playback device 200 to an external audio amplifier or audio-visual receiver.

In one example, the processor 202 may be a clock-driven computing component configured to process input data according to instructions stored in the memory 206. The memory 206 may be a tangible computer-readable medium configured to store instructions executable by the processor 202. For instance, the memory 206 may be data storage that can be loaded with one or more of the software components 204 executable by the processor 202 to achieve certain functions. In one example, the functions may involve the playback

US 9,219,460 B2

5

device **200** retrieving audio data from an audio source or another playback device. In another example, the functions may involve the playback device **200** sending audio data to another device or playback device on a network. In yet another example, the functions may involve pairing of the playback device **200** with one or more playback devices to create a multi-channel audio environment.

Certain functions may involve the playback device **200** synchronizing playback of audio content with one or more other playback devices. During synchronous playback, a listener will preferably not be able to perceive time-delay differences between playback of the audio content by the playback device **200** and the one or more other playback devices. U.S. Pat. No. 8,234,395 entitled, "System and method for synchronizing operations among a plurality of independently clocked digital data processing devices," which is hereby incorporated by reference, provides in more detail some examples for audio playback synchronization among playback devices.

The memory **206** may further be configured to store data associated with the playback device **200**, such as one or more zones and/or zone groups the playback device **200** is a part of, audio sources accessible by the playback device **200**, or a playback queue that the playback device **200** (or some other playback device) may be associated with. The data may be stored as one or more state variables that are periodically updated and used to describe the state of the playback device **200**. The memory **206** may also include the data associated with the state of the other devices of the media system, and shared from time to time among the devices so that one or more of the devices have the most recent data associated with the system. Other embodiments are also possible.

The audio processing components **208** may include one or more digital-to-analog converters (DAC), an audio pre-processing component, an audio enhancement component or a digital signal processor (DSP), and so on. In one embodiment, one or more of the audio processing components **208** may be a subcomponent of the processor **202**. In one example, audio content may be processed and/or intentionally altered by the audio processing components **208** to produce audio signals. The produced audio signals may then be provided to the audio amplifier(s) **210** for amplification and playback through speaker(s) **212**. Particularly, the audio amplifier(s) **210** may include devices configured to amplify audio signals to a level for driving one or more of the speakers **212**. The speaker(s) **212** may include an individual transducer (e.g., a "driver") or a complete speaker system involving an enclosure with one or more drivers. A particular driver of the speaker(s) **212** may include, for example, a subwoofer (e.g., for low frequencies), a mid-range driver (e.g., for middle frequencies), and/or a tweeter (e.g., for high frequencies). In some cases, each transducer in the one or more speakers **212** may be driven by an individual corresponding audio amplifier of the audio amplifier(s) **210**. In addition to producing analog signals for playback by the playback device **200**, the audio processing components **208** may be configured to process audio content to be sent to one or more other playback devices for playback.

Audio content to be processed and/or played back by the playback device **200** may be received from an external source, such as via an audio line-in input connection (e.g., an auto-detecting 3.5 mm audio line-in connection) or the network interface **214**.

The network interface **214** may be configured to facilitate a data flow between the playback device **200** and one or more other devices on a data network. As such, the playback device **200** may be configured to receive audio content over the data network from one or more other playback devices in commu-

6

nication with the playback device **200**, network devices within a local area network, or audio content sources over a wide area network such as the Internet. In one example, the audio content and other signals transmitted and received by the playback device **200** may be transmitted in the form of digital packet data containing an Internet Protocol (IP)-based source address and IP-based destination addresses. In such a case, the network interface **214** may be configured to parse the digital packet data such that the data destined for the playback device **200** is properly received and processed by the playback device **200**.

As shown, the network interface **214** may include wireless interface(s) **216** and wired interface(s) **218**. The wireless interface(s) **216** may provide network interface functions for the playback device **200** to wirelessly communicate with other devices (e.g., other playback device(s), speaker(s), receiver(s), network device(s), control device(s) within a data network the playback device **200** is associated with) in accordance with a communication protocol (e.g., any wireless standard including IEEE 802.11a, 802.11b, 802.11g, 802.11n, 802.11 ac, 802.15, 4G mobile communication standard, and so on). The wired interface(s) **218** may provide network interface functions for the playback device **200** to communicate over a wired connection with other devices in accordance with a communication protocol (e.g., IEEE 802.3). While the network interface **214** shown in FIG. 2 includes both wireless interface(s) **216** and wired interface(s) **218**, the network interface **214** may in some embodiments include only wireless interface(s) or only wired interface(s).

The microphone **220** may be arranged to detect sound in the environment of the playback device **200**. For instance, the microphone may be mounted on an exterior wall of a housing of the playback device. The microphone may be any type of microphone now known or later developed such as a condenser microphone, electret condenser microphone, or a dynamic microphone. The microphone may be sensitive to a portion of the frequency range of the speaker(s) **220**. One or more of the speaker(s) **220** may operate in reverse as the microphone **220**.

In one example, the playback device **200** and one other playback device may be paired to play two separate audio components of audio content. For instance, playback device **200** may be configured to play a left channel audio component, while the other playback device may be configured to play a right channel audio component, thereby producing or enhancing a stereo effect of the audio content. The paired playback devices (also referred to as "bonded playback devices") may further play audio content in synchrony with other playback devices.

In another example, the playback device **200** may be sonically consolidated with one or more other playback devices to form a single, consolidated playback device. A consolidated playback device may be configured to process and reproduce sound differently than an unconsolidated playback device or playback devices that are paired, because a consolidated playback device may have additional speaker drivers through which audio content may be rendered. For instance, if the playback device **200** is a playback device designed to render low frequency range audio content (i.e. a subwoofer), the playback device **200** may be consolidated with a playback device designed to render full frequency range audio content. In such a case, the full frequency range playback device, when consolidated with the low frequency playback device **200**, may be configured to render only the mid and high frequency components of audio content, while the low frequency range playback device **200** renders the low frequency component of the audio content. The consolidated playback

US 9,219,460 B2

7

device may further be paired with a single playback device or yet another consolidated playback device.

By way of illustration, SONOS, Inc. presently offers (or has offered) for sale certain playback devices including a “PLAY:1,” “PLAY:3,” “PLAY:5,” “PLAYBAR,” “CONNECT:AMP,” “CONNECT,” and “SUB.” Any other past, present, and/or future playback devices may additionally or alternatively be used to implement the playback devices of example embodiments disclosed herein. Additionally, it is understood that a playback device is not limited to the example illustrated in FIG. 2 or to the SONOS product offerings. For example, a playback device may include a wired or wireless headphone. In another example, a playback device may include or interact with a docking station for personal mobile media playback devices. In yet another example, a playback device may be integral to another device or component such as a television, a lighting fixture, or some other device for indoor or outdoor use.

b. Example Playback Zone Configurations

Referring back to the media playback system 100 of FIG. 1, the environment may have one or more playback zones, each with one or more playback devices. The media playback system 100 may be established with one or more playback zones, after which one or more zones may be added, or removed to arrive at the example configuration shown in FIG. 1. Each zone may be given a name according to a different room or space such as an office, bathroom, master bedroom, bedroom, kitchen, dining room, living room, and/or balcony. In one case, a single playback zone may include multiple rooms or spaces. In another case, a single room or space may include multiple playback zones.

As shown in FIG. 1, the balcony, dining room, kitchen, bathroom, office, and bedroom zones each have one playback device, while the living room and master bedroom zones each have multiple playback devices. In the living room zone, playback devices 104, 106, 108, and 110 may be configured to play audio content in synchrony as individual playback devices, as one or more bonded playback devices, as one or more consolidated playback devices, or any combination thereof. Similarly, in the case of the master bedroom, playback devices 122 and 124 may be configured to play audio content in synchrony as individual playback devices, as a bonded playback device, or as a consolidated playback device.

In one example, one or more playback zones in the environment of FIG. 1 may each be playing different audio content. For instance, the user may be grilling in the balcony zone and listening to hip hop music being played by the playback device 102 while another user may be preparing food in the kitchen zone and listening to classical music being played by the playback device 114. In another example, a playback zone may play the same audio content in synchrony with another playback zone. For instance, the user may be in the office zone where the playback device 118 is playing the same rock music that is being played by playback device 102 in the balcony zone. In such a case, playback devices 102 and 118 may be playing the rock music in synchrony such that the user may seamlessly (or at least substantially seamlessly) enjoy the audio content that is being played out-loud while moving between different playback zones. Synchronization among playback zones may be achieved in a manner similar to that of synchronization among playback devices, as described in previously referenced U.S. Pat. No. 8,234,395.

As suggested above, the zone configurations of the media playback system 100 may be dynamically modified, and in some embodiments, the media playback system 100 supports numerous configurations. For instance, if a user physically

8

moves one or more playback devices to or from a zone, the media playback system 100 may be reconfigured to accommodate the change(s). For instance, if the user physically moves the playback device 102 from the balcony zone to the office zone, the office zone may now include both the playback device 118 and the playback device 102. The playback device 102 may be paired or grouped with the office zone and/or renamed if so desired via a control device such as the control devices 126 and 128. On the other hand, if the one or more playback devices are moved to a particular area in the home environment that is not already a playback zone, a new playback zone may be created for the particular area.

Further, different playback zones of the media playback system 100 may be dynamically combined into zone groups or split up into individual playback zones. For instance, the dining room zone and the kitchen zone 114 may be combined into a zone group for a dinner party such that playback devices 112 and 114 may render audio content in synchrony. On the other hand, the living room zone may be split into a television zone including playback device 104, and a listening zone including playback devices 106, 108, and 110, if the user wishes to listen to music in the living room space while another user wishes to watch television.

c. Example Control Devices

FIG. 3 shows a functional block diagram of an example control device 300 that may be configured to be one or both of the control devices 126 and 128 of the media playback system 100. As shown, the control device 300 may include a processor 302, memory 304, a network interface 306, and a user interface 308. In one example, the control device 300 may be a dedicated controller for the media playback system 100. In another example, the control device 300 may be a network device on which media playback system controller application software may be installed, such as for example, an iPhone™ iPad™ or any other smart phone, tablet or network device (e.g., a networked computer such as a PC or Mac™).

The processor 302 may be configured to perform functions relevant to facilitating user access, control, and configuration of the media playback system 100. The memory 304 may be configured to store instructions executable by the processor 302 to perform those functions. The memory 304 may also be configured to store the media playback system controller application software and other data associated with the media playback system 100 and the user.

In one example, the network interface 306 may be based on an industry standard (e.g., infrared, radio, wired standards including IEEE 802.3, wireless standards including IEEE 802.11a, 802.11b, 802.11g, 802.11n, 802.11ac, 802.15, 4G mobile communication standard, and so on). The network interface 306 may provide a means for the control device 300 to communicate with other devices in the media playback system 100. In one example, data and information (e.g., such as a state variable) may be communicated between control device 300 and other devices via the network interface 306. For instance, playback zone and zone group configurations in the media playback system 100 may be received by the control device 300 from a playback device or another network device, or transmitted by the control device 300 to another playback device or network device via the network interface 306. In some cases, the other network device may be another control device.

Playback device control commands such as volume control and audio playback control may also be communicated from the control device 300 to a playback device via the network interface 306. As suggested above, changes to configurations of the media playback system 100 may also be performed by a user using the control device 300. The configuration

US 9,219,460 B2

9

changes may include adding/removing one or more playback devices to/from a zone, adding/removing one or more zones to/from a zone group, forming a bonded or consolidated player, separating one or more playback devices from a bonded or consolidated player, among others. Accordingly, the control device **300** may sometimes be referred to as a controller, whether the control device **300** is a dedicated controller or a network device on which media playback system controller application software is installed.

The user interface **308** of the control device **300** may be configured to facilitate user access and control of the media playback system **100**, by providing a controller interface such as the controller interface **400** shown in FIG. **4**. The controller interface **400** includes a playback control region **410**, a playback zone region **420**, a playback status region **430**, a playback queue region **440**, and an audio content sources region **450**. The user interface **400** as shown is just one example of a user interface that may be provided on a network device such as the control device **300** of FIG. **3** (and/or the control devices **126** and **128** of FIG. **1**) and accessed by users to control a media playback system such as the media playback system **100**. Other user interfaces of varying formats, styles, and interactive sequences may alternatively be implemented on one or more network devices to provide comparable control access to a media playback system.

The playback control region **410** may include selectable (e.g., by way of touch or by using a cursor) icons to cause playback devices in a selected playback zone or zone group to play or pause, fast forward, rewind, skip to next, skip to previous, enter/exit shuffle mode, enter/exit repeat mode, enter/exit cross fade mode. The playback control region **410** may also include selectable icons to modify equalization settings, and playback volume, among other possibilities.

The playback zone region **420** may include representations of playback zones within the media playback system **100**. In some embodiments, the graphical representations of playback zones may be selectable to bring up additional selectable icons to manage or configure the playback zones in the media playback system, such as a creation of bonded zones, creation of zone groups, separation of zone groups, and renaming of zone groups, among other possibilities.

For example, as shown, a “group” icon may be provided within each of the graphical representations of playback zones. The “group” icon provided within a graphical representation of a particular zone may be selectable to bring up options to select one or more other zones in the media playback system to be grouped with the particular zone. Once grouped, playback devices in the zones that have been grouped with the particular zone will be configured to play audio content in synchrony with the playback device(s) in the particular zone. Analogously, a “group” icon may be provided within a graphical representation of a zone group. In this case, the “group” icon may be selectable to bring up options to deselect one or more zones in the zone group to be removed from the zone group. Other interactions and implementations for grouping and ungrouping zones via a user interface such as the user interface **400** are also possible. The representations of playback zones in the playback zone region **420** may be dynamically updated as playback zone or zone group configurations are modified.

The playback status region **430** may include graphical representations of audio content that is presently being played, previously played, or scheduled to play next in the selected playback zone or zone group. The selected playback zone or zone group may be visually distinguished on the user interface, such as within the playback zone region **420** and/or the playback status region **430**. The graphical representations

10

may include track title, artist name, album name, album year, track length, and other relevant information that may be useful for the user to know when controlling the media playback system via the user interface **400**.

The playback queue region **440** may include graphical representations of audio content in a playback queue associated with the selected playback zone or zone group. In some embodiments, each playback zone or zone group may be associated with a playback queue containing information corresponding to zero or more audio items for playback by the playback zone or zone group. For instance, each audio item in the playback queue may comprise a uniform resource identifier (URI), a uniform resource locator (URL) or some other identifier that may be used by a playback device in the playback zone or zone group to find and/or retrieve the audio item from a local audio content source or a networked audio content source, possibly for playback by the playback device.

In one example, a playlist may be added to a playback queue, in which case information corresponding to each audio item in the playlist may be added to the playback queue. In another example, audio items in a playback queue may be saved as a playlist. In a further example, a playback queue may be empty, or populated but “not in use” when the playback zone or zone group is playing continuously streaming audio content, such as Internet radio that may continue to play until otherwise stopped, rather than discrete audio items that have playback durations. In an alternative embodiment, a playback queue can include Internet radio and/or other streaming audio content items and be “in use” when the playback zone or zone group is playing those items. Other examples are also possible.

When playback zones or zone groups are “grouped” or “ungrouped,” playback queues associated with the affected playback zones or zone groups may be cleared or re-associated. For example, if a first playback zone including a first playback queue is grouped with a second playback zone including a second playback queue, the established zone group may have an associated playback queue that is initially empty, that contains audio items from the first playback queue (such as if the second playback zone was added to the first playback zone), that contains audio items from the second playback queue (such as if the first playback zone was added to the second playback zone), or a combination of audio items from both the first and second playback queues. Subsequently, if the established zone group is ungrouped, the resulting first playback zone may be re-associated with the previous first playback queue, or be associated with a new playback queue that is empty or contains audio items from the playback queue associated with the established zone group before the established zone group was ungrouped. Similarly, the resulting second playback zone may be re-associated with the previous second playback queue, or be associated with a new playback queue that is empty, or contains audio items from the playback queue associated with the established zone group before the established zone group was ungrouped. Other examples are also possible.

Referring back to the user interface **400** of FIG. **4**, the graphical representations of audio content in the playback queue region **440** may include track titles, artist names, track lengths, and other relevant information associated with the audio content in the playback queue. In one example, graphical representations of audio content may be selectable to bring up additional selectable icons to manage and/or manipulate the playback queue and/or audio content represented in the playback queue. For instance, a represented audio content may be removed from the playback queue, moved to a different position within the playback queue, or

US 9,219,460 B2

11

selected to be played immediately, or after any currently playing audio content, among other possibilities. A playback queue associated with a playback zone or zone group may be stored in a memory on one or more playback devices in the playback zone or zone group, on a playback device that is not in the playback zone or zone group, and/or some other designated device.

The audio content sources region **450** may include graphical representations of selectable audio content sources from which audio content may be retrieved and played by the selected playback zone or zone group. Discussions pertaining to audio content sources may be found in the following section.

d. Example Audio Content Sources

As indicated previously, one or more playback devices in a zone or zone group may be configured to retrieve for playback audio content (e.g. according to a corresponding URI or URL for the audio content) from a variety of available audio content sources. In one example, audio content may be retrieved by a playback device directly from a corresponding audio content source (e.g., a line-in connection). In another example, audio content may be provided to a playback device over a network via one or more other playback devices or network devices.

Example audio content sources may include a memory of one or more playback devices in a media playback system such as the media playback system **100** of FIG. **1**, local music libraries on one or more network devices (such as a control device, a network-enabled personal computer, or a networked-attached storage (NAS), for example), streaming audio services providing audio content via the Internet (e.g., the cloud), or audio sources connected to the media playback system via a line-in input connection on a playback device or network device, among other possibilities.

In some embodiments, audio content sources may be regularly added or removed from a media playback system such as the media playback system **100** of FIG. **1**. In one example, an indexing of audio items may be performed whenever one or more audio content sources are added, removed or updated. Indexing of audio items may involve scanning for identifiable audio items in all folders/directory shared over a network accessible by playback devices in the media playback system, and generating or updating an audio content database containing metadata (e.g., title, artist, album, track length, among others) and other associated information, such as a URI or URL for each identifiable audio item found. Other examples for managing and maintaining audio content sources may also be possible.

The above discussions relating to playback devices, controller devices, playback zone configurations, and media content sources provide only some examples of operating environments within which functions and methods described below may be implemented. Other operating environments and configurations of media playback systems, playback devices, and network devices not explicitly described herein may also be applicable and suitable for implementation of the functions and methods.

III. Example Method for Adjusting Equalization Based on Environment

As discussed above, embodiments described herein may involve dynamically adjusting the equalization of a playback device based on the environment in which the playback device is operating.

Method **500** shown in FIG. **5** presents an embodiment of a method that can be implemented within an operating envi-

12

ronment involving, for example, the media playback system **100** of FIG. **1**, one or more of the playback device **200** of FIG. **2**, and one or more of the control device **300** of FIG. **3**. Method **500** may include one or more operations, functions, or actions as illustrated by one or more of blocks **502-510**. Although the blocks are illustrated in sequential order, these blocks may also be performed in parallel, and/or in a different order than those described herein. Also, the various blocks may be combined into fewer blocks, divided into additional blocks, and/or removed based upon the desired implementation.

In addition, for the method **500** and other processes and methods disclosed herein, the flowchart shows functionality and operation of one possible implementation of present embodiments. In this regard, each block may represent a module, a segment, or a portion of program code, which includes one or more instructions executable by a processor for implementing specific logical functions or steps in the process. The program code may be stored on any type of computer readable medium, for example, such as a storage device including a disk or hard drive. The computer readable medium may include non-transitory computer readable medium, for example, such as computer-readable media that stores data for short periods of time like register memory, processor cache and Random Access Memory (RAM). The computer readable medium may also include non-transitory media, such as secondary or persistent long term storage, like read only memory (ROM), optical or magnetic disks, compact-disc read only memory (CD-ROM), for example. The computer readable media may also be any other volatile or non-volatile storage systems. The computer readable medium may be considered a computer readable storage medium, for example, or a tangible storage device. In addition, for the method **500** and other processes and methods disclosed herein, each block in FIG. **5** may represent circuitry that is wired to perform the specific logical functions in the process.

a. Emitting a First Audio Signal from a Playback Device.

At block **502**, the playback device emits a first audio signal from the playback device. For instance, playback device **200** of FIG. **2** may output the first audio signal from speaker(s) **212**.

The first audio signal may take a variety of different forms. For instance, the first audio signal may include a pulse. Such a pulse may be a recording of a brief audio pulse that approximates an audio impulse signal. Some examples include recordings of an electric spark, a starter pistol shot, or the bursting of a balloon. In some examples, the first audio signal may include a signal that varies over frequency, such as a logarithmic chirp, a sine sweep, a pink noise signal, or a maximum length sequence. Such signals may be chosen for relatively broader-range coverage of the frequency spectrum or for other reasons. The first audio signal may involve other types of audio signals as well.

The first audio signal may have a particular waveform. For instance, the waveform may correspond to any of these example audio signals described above, such as, an electric spark, a starter pistol shot, or the bursting of a balloon. Such a waveform may be represented digitally, such as in an array of data points (i.e. samples) representing the changes in sound pressure over time. The waveform of the first audio signal may be referred to as the first waveform.

The playback device may store the first audio signal as a recording. Then, when emitting the first audio signal, the playback device may playback the recording. The recording may take a variety of audio file formats, such as a waveform audio file format (WAV) or an MPEG-2 audio layer III (MP3), among other examples.

US 9,219,460 B2

13

Alternatively, the playback device may dynamically generate the first audio signal. For instance, the playback device may generate a signal that varies over frequency according to a mathematical equation. Other examples are possible as well.

The playback device may emit the first audio signal at a particular sound pressure level (i.e. magnitude). The particular sound pressure level may reflect the peak magnitude of the first audio signal. For instance, the playback device may emit a pulse signal having a peak magnitude of 60 dB (with reference to 20 μ Pa). The sound pressure level may be configurable. For instance, user input to playback device **200** (or a controller thereof, such as network device **300**) may configure the sound pressure of the first audio signal at a particular sound pressure level. Alternatively, the sound pressure level may be pre-determined.

The playback device may emit the first audio signal in response to a trigger. Further, the trigger may cause the playback device to carry out additional functions of the present method. For instance, user input to playback device **200** (or a controller thereof, such as network device **300**) may trigger playback device **200** to carry out the present method to adjust the equalization of the playback device. As another example, movement of the playback device (i.e. a change of positioning or in location) may trigger the playback device **200** to carry out the present method. The playback device may detect such a movement via an accelerometer. Other types of triggers are possible as well.

As described above, the playback device may be arranged as part of a media playback system that may include a plurality of playback devices. Each playback device of the media playback system may emit a respective first audio signal. Further, each playback device may perform one or more of the functions described below. For instance, each playback device may emit a respective first audio signal, detect a respective second audio signal, determine one or more respective reflection characteristics, adjust an equalization setting, and cause an audio track to play.

In one instance, a media playback system may include a first playback device and a second playback device. The first playback device may emit the first audio signal and then detect the second audio signal (as discussed below). In addition, the second playback device may emit a third audio signal. The third audio signal may take a variety of forms, including, for instance, any of the example audio signals described above in relation to the first audio signal. In some embodiments, the second playback device may emit the third audio signal in response to receiving an instruction, from the first playback device, to emit the third audio signal. Alternatively, the second playback device may receive the instruction from a controller. Other examples are possible as well.

b. Detecting, by the Playback Device, a Second Audio Signal.

At block **504**, the playback device detects, by a microphone, a second audio signal. A portion of the second audio signal may be a reflection of the first audio signal. For instance, playback device **200** may emit the first audio signal, the first audio signal may reflect off of one or more objects (collectively these reflections may be referred to as reverberation), and microphone **220** may detect these reflections as the second audio signal. Another portion of the second audio signal may be a direct propagation of the first audio signal.

The microphone may be communicatively coupled to the processor. For instance, microphone **220** may be coupled to an analog input of processor **202** of playback device **200**. Alternatively, microphone **220** may be coupled to an analog-to-digital converter that is coupled, in turn, to processor **202**. Other arrangements are possible as well.

14

Detecting the second audio signal may involve recording the second audio signal. For instance, processor **202** may record the second audio signal and then store the second audio signal in memory **206**. Processor **202** may begin recording when the speaker emits the first audio signal. Alternatively, processor **202** may begin recording before or after the speaker emits the first audio signal such that reflections of the first audio signal may be detected by the microphone. The recording may be represented digitally, such as in an array of data points (i.e. samples) representing the changes in sound pressure over time. Further, the second audio signal may have a waveform that may be referred to as the second waveform.

In some circumstances, the second audio signal may include environmental noise. In some circumstances, significant environmental noise within the second audio signal may interfere with or otherwise affect determining the one or more reflection characteristics. For instance, environmental noise may mask or degrade the first audio signal, which may cause the playback device to determine one or more reflection characteristics that may not accurately reflect the environment because of the degradation caused by the environmental noise. Further, in some circumstances, an aspect of the environmental noise may be incorrectly detected as the first audio signal. While the second audio signal may include, as one portion, some background noise, the intention is that at least a portion of the second audio signal is the reflection of the first audio signal.

Accordingly, to reduce the possible effects of environmental noise, detecting the second audio signal may involve determining that the portion of the second audio signal is the reflection of the first audio signal based on the first waveform and the second waveform. For instance, the processor **202** may determine a difference between the first waveform and the second waveform by comparing the two waveforms. The playback device may then determine that the difference is less than a threshold which may indicate that the portion of the second audio signal is the reflection of the first audio signal. The threshold may be set such that a particular degree of similarity between the first waveform and the second waveform indicates that the portion of the second audio signal is a reflection of the first audio signal. Alternatively, several characteristics of the first waveform, such as the magnitude and duration, may be predetermined. The playback device may determine the same characteristics of the second waveform and compare the characteristics to determine that the portion of the second audio signal is the reflection of the first audio signal. As another example, the playback device may perform a deconvolution determination using the first audio signal and the second audio signal. Some embodiments may involve repeating the process described herein to reduce any effect caused by noise in a particular iteration.

The processor may determine the sound pressure level (i.e. magnitude) of the second audio signal. The sound pressure level of the second audio signal may be determined at each point along the waveform of the second audio signal or the sound pressure level may be determined at a subset of points, such as at the point having peak magnitude. For instance, the processor may determine that the second audio signal has a peak magnitude of 50 dB.

In some embodiments, the speaker and microphone may be physically coupled. For instance, a housing may contain both the speaker and the microphone. Further, the housing may additionally contain one or more other components of the playback device, such as a processor, a memory, a network interface, an audio amplifier(s), and/or various audio processing components. Therefore, in one embodiment, playback device **200** may include, within the same housing, processor

US 9,219,460 B2

15

202, software components 204, memory 206, audio processing components 208, audio amplifier(s) 210, speaker(s) 212, a network interface 214 including wireless interface(s) 216 and wired interface(s) 218 and a microphone 220. The housing may be a speaker cabinet. Other arrangements are possible as well.

As noted above, in some embodiments, the playback device may be arranged as part of a media playback system that includes two or more playback devices. In such embodiments, the playback device may detect audio signals emitted by other playback devices (as an alternative to or in addition to detecting the second audio signal). Referring to the example media playback system above that includes the first playback device and the second playback device, after the second playback device emits a third audio signal, the first playback device may detect the third audio signal and/or reflections thereof as a fourth audio signal. In some embodiments, the first playback device may then determine that at least a portion of the fourth audio signal is the third audio signal (or a reflection thereof) using, for example, any of the techniques described above.

Detecting audio signals emitted by other playback devices may include functions similar to those of detecting the second audio signal. Further, devices within the media playback system may exchange messages to coordinate the functions described herein. For instance, as noted above, a first playback device may trigger a second playback device to emit a third audio signal. As another example, the second playback device may send an indication of the third audio signal to the first playback device. The indication may assist the first playback device in determining that a portion of the fourth audio signal is the third audio signal (or a reflection thereof), for example. Alternatively, receiving the indication may trigger the first playback device to start listening for an audio signal from the second playback device.

In some embodiments, the first media playback may detect a plurality of audio signals. For instance, the plurality of audio signals may include a reflection of a signal emitted by the first playback device. The plurality of audio signals may also include signals (or reflections thereof) emitted by other playback devices within the media playback system. Other examples are possible as well.

c. Determining One or More Reflection Characteristics.

At block 506, the playback device determines one or more reflection characteristics. Each of the one or more reflection characteristics may indicate an aspect of the environment surrounding the playback device. For instance, one reflection characteristic may indicate that the playback device is inside, or that the playback device is outside. The reflection characteristic may also indicate a relative size of the room that the playback device is currently located within. Another reflection characteristic may indicate the amount of sound absorbing material in the environment. A third reflection characteristic may indicate one or more resonant frequencies of the environment. Many examples are possible.

In some embodiments, each of the one or more reflection characteristics may be based on at least the second audio signal. For instance, the processor 202 may determine one or more reflection characteristics based on the recording of the second audio signal. The one or more reflection characteristics may be further based on the first audio signal such as in a comparison of the second audio signal to the first audio signal.

One of the one or more reflection characteristics may be an amount of time elapsed from emitting the first audio signal to detecting the second audio signal. For instance, the processor 202 may assign to the first audio signal a first timestamp at the

16

time of emitting the first audio signal and may further assign to the second audio signal a second time stamp at the time of detecting the second audio signal. The processor 202 may then determine a difference between the second time stamp and the first time stamp. Since each of the first audio signal and the second audio signal may be emitted and detected, respectively, over a duration of time, the time stamp may be assigned to a particular point in each of the first audio signal and the second audio signal. For instance, the time stamp may be assigned to the respective peaks of the first and second audio signals.

The reflection characteristic may be a qualitative characteristic. For instance, the qualitative characteristic may describe different types of operating environments, such as a “small room,” a “large room,” or “outdoors.” The qualitative characteristic may be based upon a quantitative value, such as an amount of time elapsed from emitting the first signal to detecting the second audio signal. For example, the playback device may determine the qualitative characteristic (e.g. “small room,” “large room,” or “outdoors”) based on a range of values for the amount of time elapsed from emitting the first signal. For example, an amount of time elapsed from emitting the first signal to detecting the second audio signal of 15-20 milliseconds (ms) may indicate a “small room,” 20-30 ms may indicate a “large room,” and an amount of time greater than 30 ms may indicate “outdoors.”

The qualitative characteristics may describe additional features of the room. For instance, the qualitative characteristic may describe a number of objects within the room. Alternatively, the qualitative characteristic may further describe the shape of the room. For example, a qualitative characteristic may indicate “high ceilings” in a “small room” or that the room is relatively much longer than it is wide (i.e. the room is long and narrow).

One or more of the reflection characteristics may relate to a frequency response of a system that includes the playback device and the environment surrounding the playback device. Such a frequency response may be determined based on the emitted first audio signal and detected second audio signal. In particular, the first audio signal (i.e. the stimulus) may excite the system. The detected second audio signal then represents the response of the system in the time domain. The playback device may then determine the frequency response by transforming the time domain response to the frequency domain, such as by determining a Laplace transform on the second audio signal, or the portion thereof that is a reflection of the first audio signal. In some embodiments, determining the Laplace transform may involve determining, by the processor 202, a fast Fourier transform (FFT), such as when the second audio signal is represented as discrete data points. While the FFT is provided by way of example, alternative transformations, such as a Hilbert transform, may be determined as well.

The determined frequency response of the system may indicate aspects of the environment. For instance, the processor 202 may determine that the bass frequencies within the frequency response are attenuated relative to the mid and/or treble frequencies, which may indicate that the playback device is outdoors. As another example, the processor 202 may determine that the frequency response has one or more resonant frequencies (which may be caused by the room or objects therein), which may be indicated by one or more peaks and/or one or more valleys. In addition, the number of peaks and valleys may indicate a degree of irregularity of the environment (i.e. a number of objects within the environment and/or an irregularity of the arrangement of the walls).

Within examples, one of the one or more reflection characteristics may relate to a variance between the frequency

17

response of the system and an “ideal” frequency response of the playback device. For instance, the reflection characteristic may be a difference between the “ideal” frequency response and the frequency response of the system. In some embodiments, the reflection characteristic may be a difference between the ideal frequency response and the current frequency response at a particular frequency range, such as bass, mid, or treble frequencies.

Determining the difference between the “ideal” frequency response and the current frequency response may involve, for each frequency response, integrating the respective frequency response over frequency for a portion of the frequency range. For instance, the processor 202 may integrate each frequency response over bass frequencies (e.g. 16 to 512 Hz). The processor 202 may then determine a difference between the integrated frequencies.

The “ideal” frequency response may be a frequency response of the playback device in a particular configuration. Further, the ideal frequency response may not be truly ideal, but rather an approximation of a playback device that is operating as designed. For instance, the “ideal” frequency response may be a frequency response of the playback device as determined in open space. Alternatively, the “ideal” frequency response may be a frequency response determined in an anechoic chamber. Further, the “ideal” frequency response of the playback device may be an approximation of a factory configured frequency response. For instance, the “ideal” frequency response may be a typical or average frequency response of playback devices of a particular type produced by a manufacturer.

In another embodiment, the playback device may determine the “ideal” frequency response as an aspect of a set-up procedure. For example, during the set-up procedure, a user of the playback device may be instructed to place the playback device in a particular arrangement so that the playback device may determine a frequency response. The particular arrangement may be, for instance, in the center of a room, among other examples.

FIG. 7 shows an illustrative plot of a frequency response of a playback device in a small room. Frequency response 702 shows the frequency response without an adjusted equalization setting. In a small room, the frequency response tends to have more peaks and valleys at bass frequencies, as shown, because bass frequencies may resonate more in a smaller room. Frequency response 704 shows the frequency response after an equalization setting for the small room has been applied. Compared to frequency response 702, the peaks and valleys are attenuated in frequency response 704, as shown.

One or more of the reflection characteristics may relate to an impulse response. For instance, an impulse response may indicate one or more reflections of the first audio signal. The impulse response may also indicate characteristics of the reflections, such as an amount of time elapsed between two reflections.

FIGS. 8A-8C show example impulse responses of a playback device. FIG. 8A shows an example impulse response of a playback device in (relatively) open space. After the initial excitation, the impulse response does not show a reflection, which may indicate that the playback device is outdoors, for example. FIG. 8B shows another example impulse response of a playback device that is near a wall. As shown in FIG. 8B, this impulse response includes a reflection of the impulse (near 8.6 ms), which may indicate the presence of a wall. FIG. 8C shows yet another example impulse response of a playback device. As shown in FIG. 8C, the impulse response includes two similar reflections of the impulse (near 8.6 ms

18

and 12 ms). Such similarity may indicate that the two similar reflections are each off of the same wall.

As noted above, in some examples, the first media playback may detect a plurality of audio signals including audio signals emitted by the first media playback and/or audio signals emitted by other playback devices within the media playback system. In some embodiments, the playback device may determine one or more reflection characteristics for each of the detected audio signals (or a portion thereof). Alternatively, a reflection characteristic may be based on two or more audio signals in the plurality of detected audio signals. Other examples are possible as well.

Referring back to the example media playback system that include the first playback device and the second playback device, after detecting the fourth audio signal, the first playback device may then determine one or more reflection characteristics based on the fourth audio signal. Determining the one or more reflection characteristics based on the fourth audio signal may involve, for instance, any of the techniques described above for determining one or more reflection characteristics based on the second audio signal as discussed above.

While characteristics of detected audio signals have been referred to herein as reflection characteristics, in some embodiments, the audio signals may be detected before a reflection occurs. For instance, as noted above, an audio signal may propagate directly, such as from a first playback device to a second playback device.

d. Adjusting an Equalization Setting of the Playback Device Based on the One or More Reflection Characteristics.

At block 508, the playback device adjusts an equalization setting of the playback device based on the one or more reflection characteristics. For instance, one or more of the audio processing components 208 may be configured to alter the frequency response of the playback device. Specifically, the one or more audio components 208 may include one or more filters. When audio content passes through the one or more filters, the amplitude of certain frequencies (or frequency ranges) may be increased. The amplitude of other frequencies (or frequency ranges) may be decreased. Alternatively, the processor 202 may be configured to alter the frequency response of the playback device. The processor 202 may, for example, apply digital signal processing, such as a digital filter, to audio content.

As noted above, one of the one or more reflections characteristics may indicate a frequency or frequency range. The playback device may adjust an equalization setting based on the frequency or frequency range. For instance, if the reflection characteristic indicates bass frequencies are attenuated, the equalization setting may boost bass frequencies (as noted above, 16-512 Hz). Alternatively, if a particular frequency, such as (2 kHz) is a peak or a valley, the equalization may responsively attenuate or boost that frequency.

Adjusting the equalization setting may involve disabling a speaker of the playback device. For instance, the processor 202 may disable the a speaker 212 when the one or more reflection characteristics indicate that the listening experience may be improved by disabling the speaker. For example, an object in close proximity to the front of the speaker may cause distortion, such as muffling, of audio outputted by the speaker. Due to the distortion, the listening experience may be improved by disabling the speaker. In such a circumstance, one or more particular reflection characteristics may indicate that the first audio signal reflected off a close object, such as an object within 10 centimeters of the playback device. Alternatively, the one or more particular reflection characteristics

US 9,219,460 B2

19

may indicate that the frequency response of the playback device is distorted by the object.

Within examples, adjusting the equalization setting may involve selecting a particular equalization preset from a plurality of equalization presets based on at least one of the one or more reflection characteristics. Some of the equalization presets may be pre-determined. For example, each of the plurality of equalization presets may be a respective bass gain setting. For instance, a “small room” equalization preset may be pre-determined to attenuate bass frequencies. As another example, an “outdoors” equalization preset may be pre-determined to boost bass frequencies. The playback device may then adjust the equalization setting according to the selected particular equalization preset.

e. Causing an Audio Track to Play According to the Adjusted Equalization Setting.

In some embodiments, the playback device may perform block 510. At block 510, the playback device may cause an audio track to play according to the adjusted equalization setting. For instance, the playback device may provide the audio track to the audio processing components 208, which may be adjusted based on the equalization setting. The audio processing components 208 may alter frequency components of the audio track according to the equalization setting. The audio amplifier 210 may then amplify the signal which may cause the speaker(s) 212 to emit the audio track.

f. Sending to a Second Media Playback Device an Indication of the Reflection Characteristic

In some embodiments, the playback device may perform block 512. At block 512, the playback device may send to a second media playback device an indication of the reflection characteristic.

Playback devices of the media playback system may share their one or more respective reflection characteristics with the other playback devices in the media playback system. In some configurations, a particular playback device may share its one or more reflection characteristics with all of the playback devices in the media playback system. In other configurations, the particular playback device may share with a subset of playback devices. For example, the particular playback device may be grouped into a zone with three other playback devices, and the particular playback device may share its one or more reflection characteristics with the three other playback devices in its zone.

For instance, referring to FIG. 1, playback device 104 may send a particular reflection characteristic to playback devices 106, 108, and 110 that are grouped with playback device 104 into a zone. In turn, each of playback devices 106, 108, and 110 may receive the particular reflection characteristic. Playback devices 106, 108, and 110 may then send a respective particular reflection characteristic to playback device 104 and to each of the other playback devices in the zone. Each of the playback devices may send and/or receive reflection characteristics via a respective network interface, such as network interface 214 in FIG. 2.

In some circumstances, the playback device may adjust the equalization setting based on determined reflection characteristics from other playback devices within the media playback system. For instance, a particular playback device may adjust its equalization setting based on reflection characteristics from other playback devices grouped with the particular playback device in a zone. Basing the equalization setting on reflection characteristics from other playback devices may result in an equalization setting that is more appropriate for the environment.

For example, FIG. 6 shows an example configuration of a media playback system 100 that includes playback devices

20

602 and 604 that are grouped into a zone. Playback devices 602 and 604 may each emit a respective first audio signal, detect a respective second audio signal, and then determine a respective reflection characteristic that indicates the size of the room. Further, playback devices 602 and 604 may exchange respective reflection characteristics by sending and receiving the reflection characteristics over respective network interfaces.

The reflection characteristic determined by playback device 602 may indicate a smaller room than the reflection characteristic determined by playback device 604 because of the relative difference in how far the each emitted first audio signal travels before coming into contact with a respective wall that reflects the first audio signal, as shown. If playback devices 602 and 604 each base their respective equalization setting on their own respective reflection characteristic, then playback device 602 may adjust the equalization to a setting that is appropriate for a small room, while playback device 604 may adjust the equalization to a setting that is appropriate for a large room. In some circumstances, this difference in relative configurations may result in a mismatch in the frequency responses between playback device 602 and 604, which may worsen the listening experience for some users (yet, in other circumstances, this difference may be minor and may not have a significant impact on the listening experiences of users). However, as noted above, playback devices 602 and 604 may adjust the equalization setting based on determined reflection characteristics from one another. For instance, playback devices 602 and 604 may each average their determined reflection characteristic with the determined reflection characteristic of the other playback device. In this manner, the resulting adjusted equalization setting for each of playback devices 602 and 604 may be somewhere between that of a large room and a small room.

Within examples, each playback device of a media playback system may share its adjusted equalization setting with the other playback devices in the media playback system, such as by sending the adjusted equalization setting to other playback devices in the media playback system. In turn, one or more of the other playback devices may adjust their equalization setting based on the received equalization settings.

For instance, a first playback device and a second playback device that are grouped into a zone may each send to one another their respective adjusted equalization setting. Then, each of the first and second playback devices may adjust their respective equalization setting based on the received equalization setting. For example, the first playback device may determine that a particular one of the two adjusted equalization settings from either the first playback device or the second playback device is preferable for the environment. The first playback device may then (i) adjust its equalization setting based on the particular one of the two adjusted equalization settings and/or (ii) instruct the second playback device to adjust its equalization setting based on the particular one of the two adjusted equalization settings.

IV. Conclusion

The description above discloses, among other things, various example systems, methods, apparatus, and articles of manufacture including, among other components, firmware and/or software executed on hardware. It is understood that such examples are merely illustrative and should not be considered as limiting. For example, it is contemplated that any or all of the firmware, hardware, and/or software aspects or components can be embodied exclusively in hardware, exclusively in software, exclusively in firmware, or in any combi-

US 9,219,460 B2

21

nation of hardware, software, and/or firmware. Accordingly, the examples provided are not the only way(s) to implement such systems, methods, apparatus, and/or articles of manufacture.

As indicated above, the present application involves dynamically adjusting the equalization of a playback device based on the environment in which the playback device is operating. In one aspect, a method is provided. The method involves emitting, by a playback device, a first audio signal, detecting, by the playback device, a second audio signal, wherein at least a portion of the second audio signal is a reflection of the first audio signal, in response to the detecting, determining one or more reflection characteristics, wherein each of the one or more reflection characteristics are based on at least the second audio signal, adjusting an equalization setting of the playback device based on the one or more reflection characteristics; and causing an audio track to play according to the adjusted equalization setting.

In another aspect, a second method is provided. The second method is operable in a media playback system comprising a plurality of playback devices, wherein each playback device comprises a respective microphone and a respective speaker. The second method involves receiving an indication of a first audio signal, detecting, by a microphone of the first playback device, a second audio signal, wherein at least a portion of the second audio signal is indicative of the first audio signal, in response to the detecting, determining a first reflection characteristic based on the second audio signal, adjusting an equalization setting of the first playback device based on at least the first reflection characteristic, and sending to a second media playback device an indication of the first reflection characteristic.

In another aspect, a device is provided. The device includes a speaker, a microphone that is physically coupled to the speaker, a processor, a network interface, a data storage, and a program logic stored in the data storage. The program logic is executable by the processor to emit a first audio signal from the speaker, detect, via the microphone, a second audio signal, wherein at least a portion of the second audio signal is a reflection of the first audio signal, in response to the detecting, determine a first reflection characteristic based on at least the second audio signal, adjust an equalization setting of the playback device based on at least the first reflection characteristic, and play, via the speaker, an audio track according to the equalization setting.

In yet another aspect, a non-transitory computer readable memory is provided. The non-transitory computer readable memory has stored thereon instructions executable by a computing device to cause the computing device to perform functions. The functions include emitting, by a playback device, a first audio signal, detecting, by the playback device, a second audio signal, wherein at least a portion of the second audio signal is a reflection of the first audio signal, in response to the detecting, determining one or more reflection characteristics, wherein each of the one or more reflection characteristics are based on at least the second audio signal, adjusting an equalization setting of the playback device based on the one or more reflection characteristics; and causing an audio track to play according to the adjusted equalization setting.

Additionally, references herein to “embodiment” means that a particular feature, structure, or characteristic described in connection with the embodiment can be included in at least one example embodiment of an invention. The appearances of this phrase in various places in the specification are not necessarily all referring to the same embodiment, nor are separate or alternative embodiments mutually exclusive of other embodiments. As such, the embodiments described

22

herein, explicitly and implicitly understood by one skilled in the art, can be combined with other embodiments.

The specification is presented largely in terms of illustrative environments, systems, procedures, steps, logic blocks, processing, and other symbolic representations that directly or indirectly resemble the operations of data processing devices coupled to networks. These process descriptions and representations are typically used by those skilled in the art to most effectively convey the substance of their work to others skilled in the art. Numerous specific details are set forth to provide a thorough understanding of the present disclosure. However, it is understood to those skilled in the art that certain embodiments of the present disclosure can be practiced without certain, specific details. In other instances, well known methods, procedures, components, and circuitry have not been described in detail to avoid unnecessarily obscuring aspects of the embodiments. Accordingly, the scope of the present disclosure is defined by the appended claims rather than the forgoing description of embodiments.

When any of the appended claims are read to cover a purely software and/or firmware implementation, at least one of the elements in at least one example is hereby expressly defined to include a tangible, non-transitory medium such as a memory, DVD, CD, Blu-ray, and so on, storing the software and/or firmware.

I claim:

1. A method comprising:

emitting, by a playback device, a first audio signal;
detecting, by the playback device, a second audio signal, wherein at least a portion of the second audio signal is a reflection of the first audio signal;
in response to the detecting, determining one or more reflection characteristics, wherein each of the one or more reflection characteristics are based on at least the second audio signal;
adjusting an equalization setting of the playback device based on the one or more reflection characteristics; and
causing an audio track to play according to the adjusted equalization setting.

2. The method of claim 1, wherein the playback device comprises a microphone and a speaker, and wherein the microphone is physically coupled to the speaker.

3. The method of claim 1, wherein the first audio signal has a first waveform, wherein the second audio signal has a second waveform, and wherein detecting the second audio signal comprises:

determining, based on the first waveform and the second waveform, that the portion of the second audio signal is the reflection of the first audio signal.

4. The method of claim 1, wherein adjusting the equalization setting of the playback device based on the one or more reflection characteristics comprises

disabling a speaker of the playback device.

5. The method of claim 1, wherein at least one of the one or more reflection characteristics comprises an amount of time elapsed from emitting the first audio signal and detecting the second audio signal.

6. The method of claim 1, wherein the first audio signal is emitted at a first sound pressure level, wherein the second audio signal is detected at a second sound pressure level, and wherein at least one of the one or more reflection characteristics comprises a difference between the first sound pressure level and the second sound pressure level.

7. The method of claim 1, wherein adjusting an equalization setting of the playback device based on the one or more reflection characteristics comprises:

US 9,219,460 B2

23

selecting a particular equalization preset from a plurality of equalization presets based on at least one of the one or more reflection characteristics; and

adjusting the equalization setting of the playback device according to the selected particular equalization preset.

8. The method of claim 7, wherein each of the plurality of equalization presets comprises a respective bass gain setting.

9. The method of claim 7, wherein at least one of the one or more reflection characteristics comprises an amount of time elapsed since emitting the first audio signal until detecting the second audio signal, wherein each of the plurality of equalization presets is matched to a respective time range, and wherein selecting one from a plurality of equalization presets based on the at least one reflection characteristic comprises:

determining a particular time range that corresponds to the amount of time; and

selecting the equalization preset matched to the determined particular time range.

10. The method of claim 1, wherein the first audio signal is an impulse signal.

11. In a media playback system comprising a plurality of playback devices, wherein each playback device comprises a respective microphone and a respective speaker, a method comprising:

receiving an indication of a first audio signal;

detecting, by a microphone of the first playback device, a second audio signal, wherein at least a portion of the second audio signal is indicative of the first audio signal; in response to the detecting, determining a first reflection characteristic based on the second audio signal;

adjusting an equalization setting of the first playback device based on at least the first reflection characteristic; and

sending to a second playback device an indication of the first reflection characteristic.

12. The method of claim 11, wherein adjusting the equalization setting is further based on at least a second reflection characteristic, the method further comprising:

receiving, via a network interface of the playback device, an indication of the second reflection characteristic from the second playback device.

13. The method of claim 11, wherein the equalization setting is further based on at least a second reflection characteristic, the method further comprising:

detecting, via a microphone of the first playback device, a fourth audio signal, wherein at least a portion of the fourth audio signal is a reflection of a third audio signal emitted by the second playback device; and determining the second reflection characteristic based on the fourth audio signal.

14. The method of claim 11, further comprising: sending an indication of the adjusted equalization setting to the second media playback device.

24

15. A playback device, comprising:

a speaker;

a microphone that is physically coupled to the speaker;

a processor;

a network interface;

a data storage; and

a program logic stored in the data storage and executable by the processor to:

emit a first audio signal from the speaker;

detect, via the microphone, a second audio signal, wherein at least a portion of the second audio signal is a reflection of the first audio signal;

in response to the detecting, determine a first reflection characteristic based on at least the second audio signal;

adjust an equalization setting of the playback device based on at least the first reflection characteristic; and play, via the speaker, an audio track according to the equalization setting.

16. The playback device of claim 15, wherein the equalization setting is further based on at least a second reflection characteristic, and wherein the program logic is further executable by the processor to:

receive, via the network interface, an indication of the second reflection characteristic from a second playback device.

17. The playback device of claim 15, wherein the equalization setting is further based on at least a second reflection characteristic, and wherein the program logic is further executable by the processor to:

detect, by the microphone, a fourth audio signal, wherein at least a portion of the fourth audio signal is indicative of a reflection of a third audio signal emitted by a second playback device; and

determine the second reflection characteristic based on the fourth audio signal.

18. The playback device of claim 15, wherein detecting the second audio signal comprises:

determining that the portion of the second audio signal is a reflection of the first audio signal.

19. The playback device of claim 15, wherein the first reflection characteristic comprises an amount of time elapsed from emitting the first audio signal to detecting the second audio signal.

20. The playback device of claim 15, wherein adjusting an equalization setting of the playback device based on at least the first reflection characteristic comprises:

selecting a particular equalization preset from a plurality of equalization presets based on the first reflection characteristic; and

adjusting the equalization setting of the playback device according to the selected particular equalization preset.

* * * * *